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Wolf et al.

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(54) **LEVELING HOLD-DOWN MECHANISM FOR LATERAL SCREENS**

(75) Inventors: **Timothy Wolf**, Andover, MN (US);
Garth Saul, Faribault, MN (US);
Michael Ekholm, Minneapolis, MN (US);
Ehrich Shaw, Coon Rapids, MN (US);
Frederick Granet, Marigny Brizay (FR);
Fabrice Courageot, Saint Georges les Baillargeaux (FR);
John Schwert, Minneapolis, MN (US)

(73) Assignee: **Johnson Screens, Inc.**, Houston, TX (US)

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B01D 24/24 (2006.01)
B01D 24/38 (2006.01)

(52) **U.S. Cl.**

USPC **210/232**; 210/289; 210/291; 210/293

(58) **Field of Classification Search**

USPC 210/232, 289, 291, 293
See application file for complete search history.

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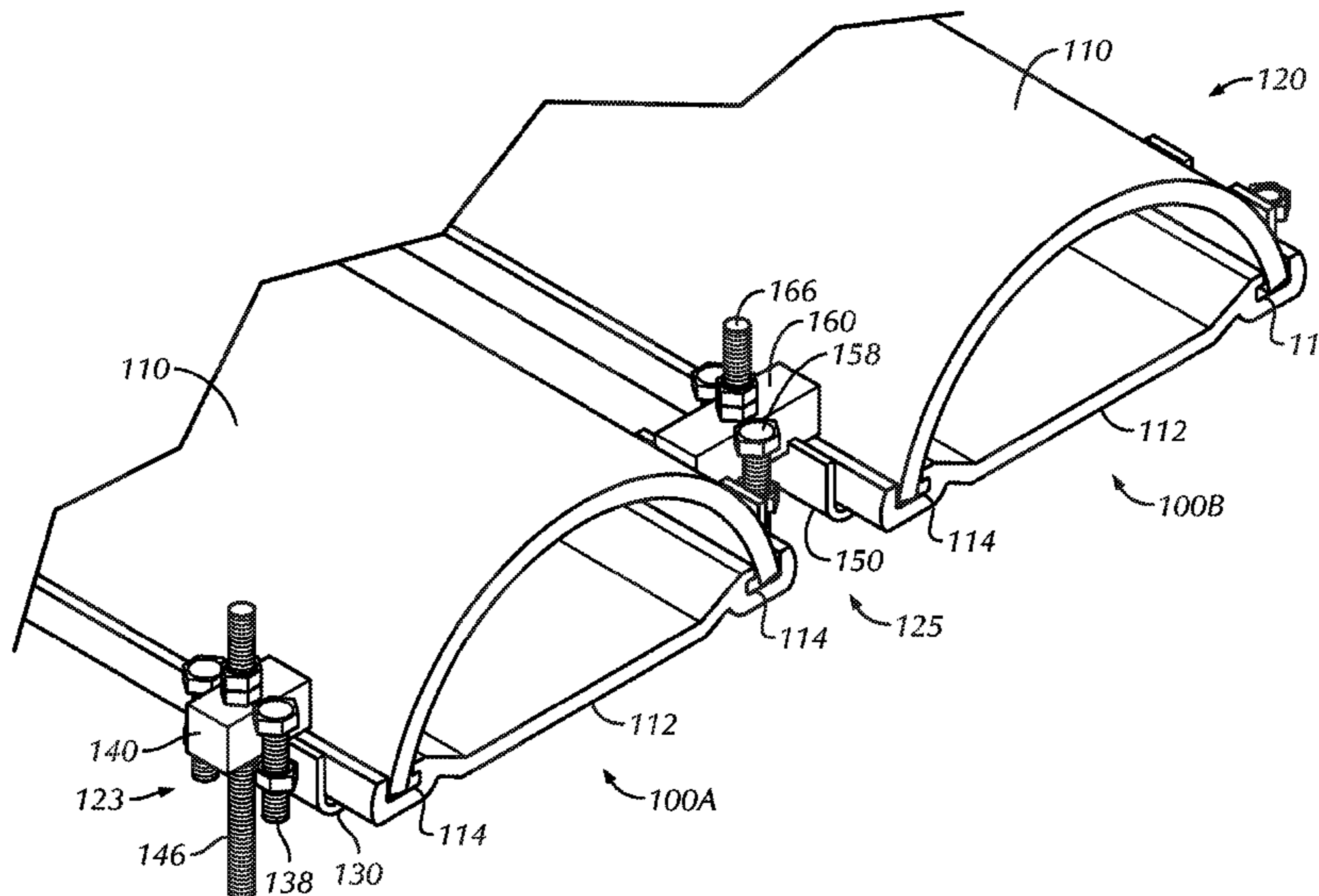
Primary Examiner — Thomas M Lithgow

(74) *Attorney, Agent, or Firm* — Moore & Van Allen PLLC

(57) **ABSTRACT**

A mechanism levels and holds down lateral screens on a basin floor having drop pipes. Support plates fit underneath the lateral screens along their length, and bolts on the ends of these support plates can be used to level the screens. Anchor bolts are affixed to the basin floor using known techniques along and between the various screens. Hold-down bars then fit on these anchor bolts and are held by washers and nuts. Ends of these bars hold against the edges of the plates and the sides of the screens to hold them against the basin floor.

18 Claims, 13 Drawing Sheets



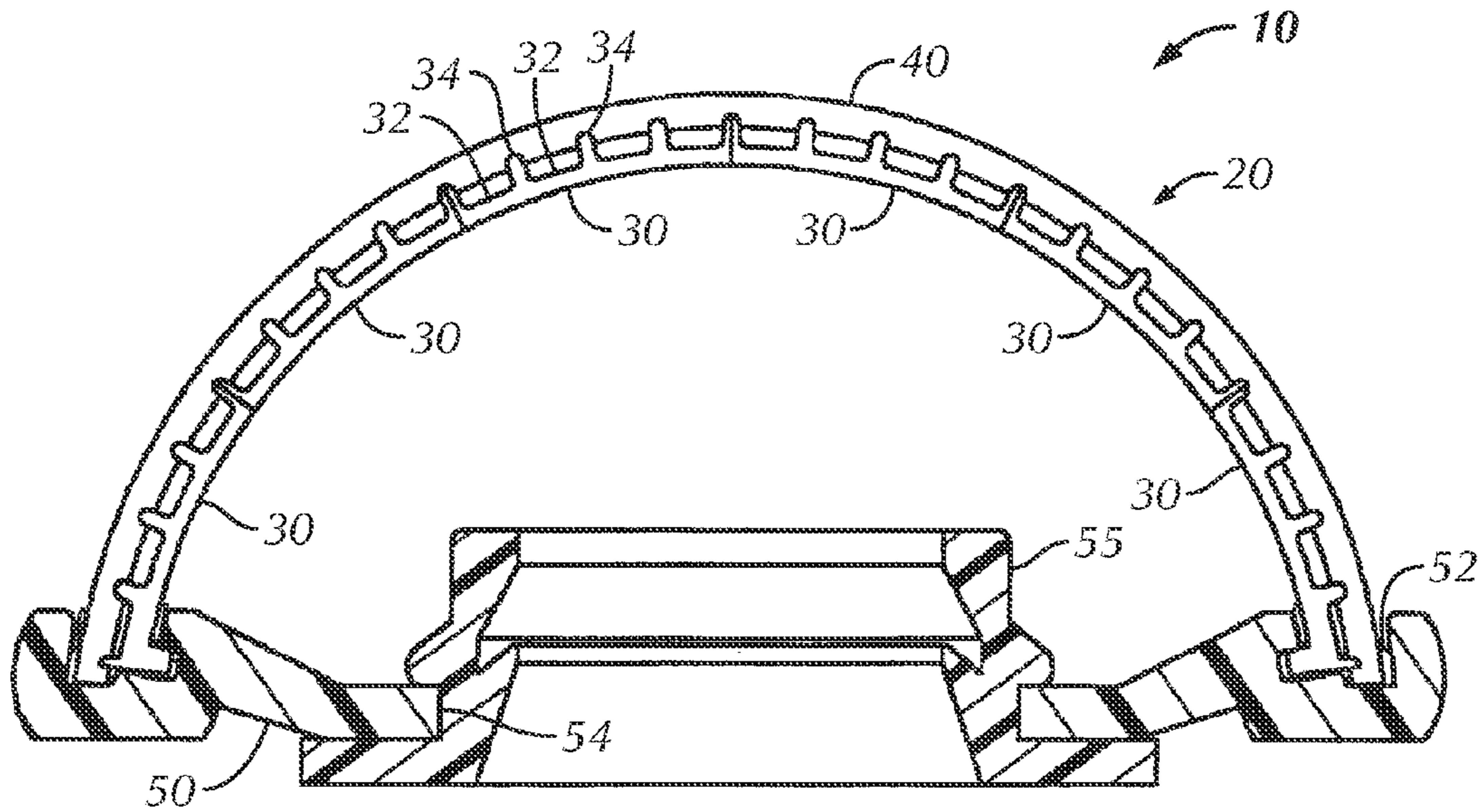


FIG. 1A
(Prior Art)

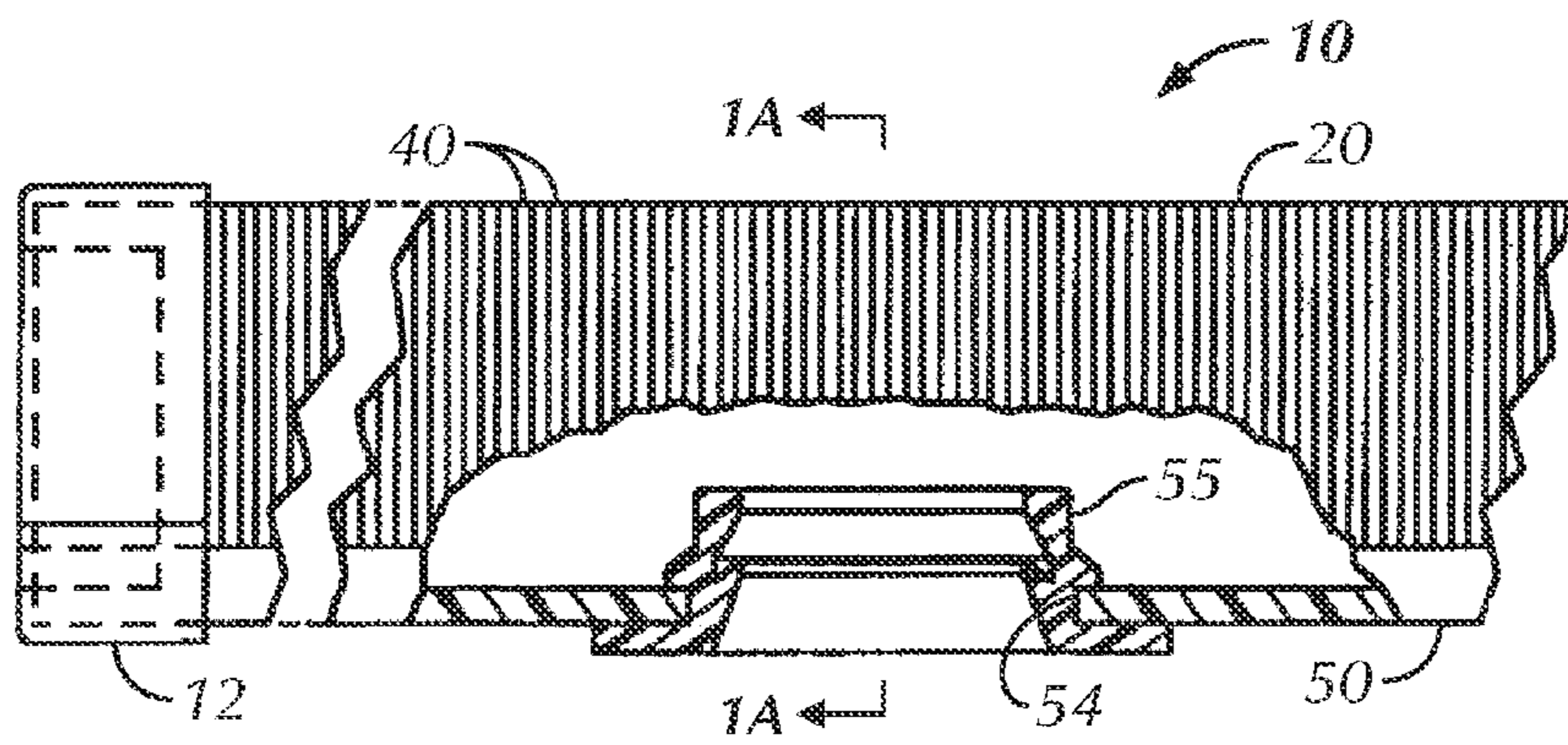


FIG. 1B
(Prior Art)

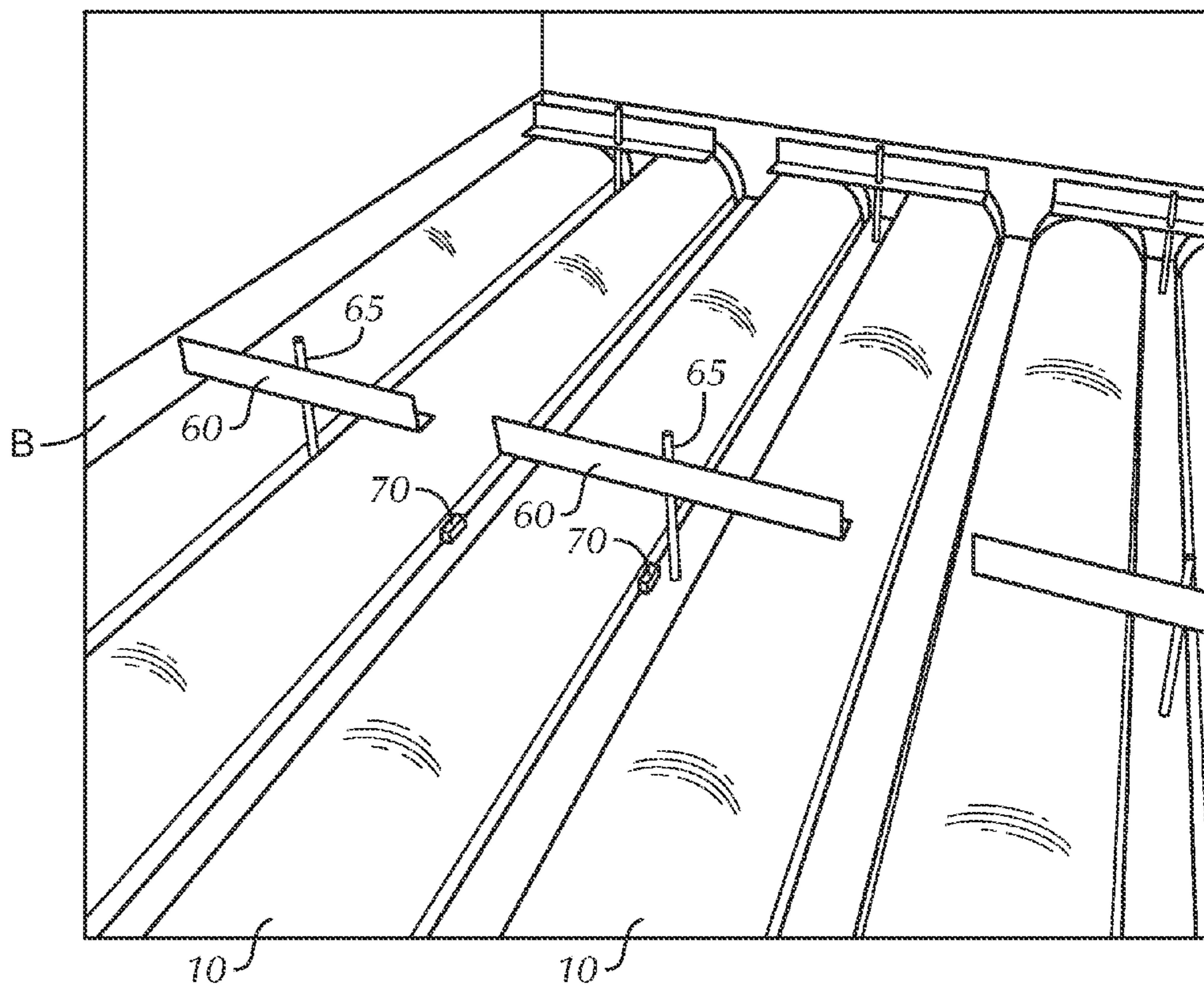


FIG. 1C
(Prior Art)

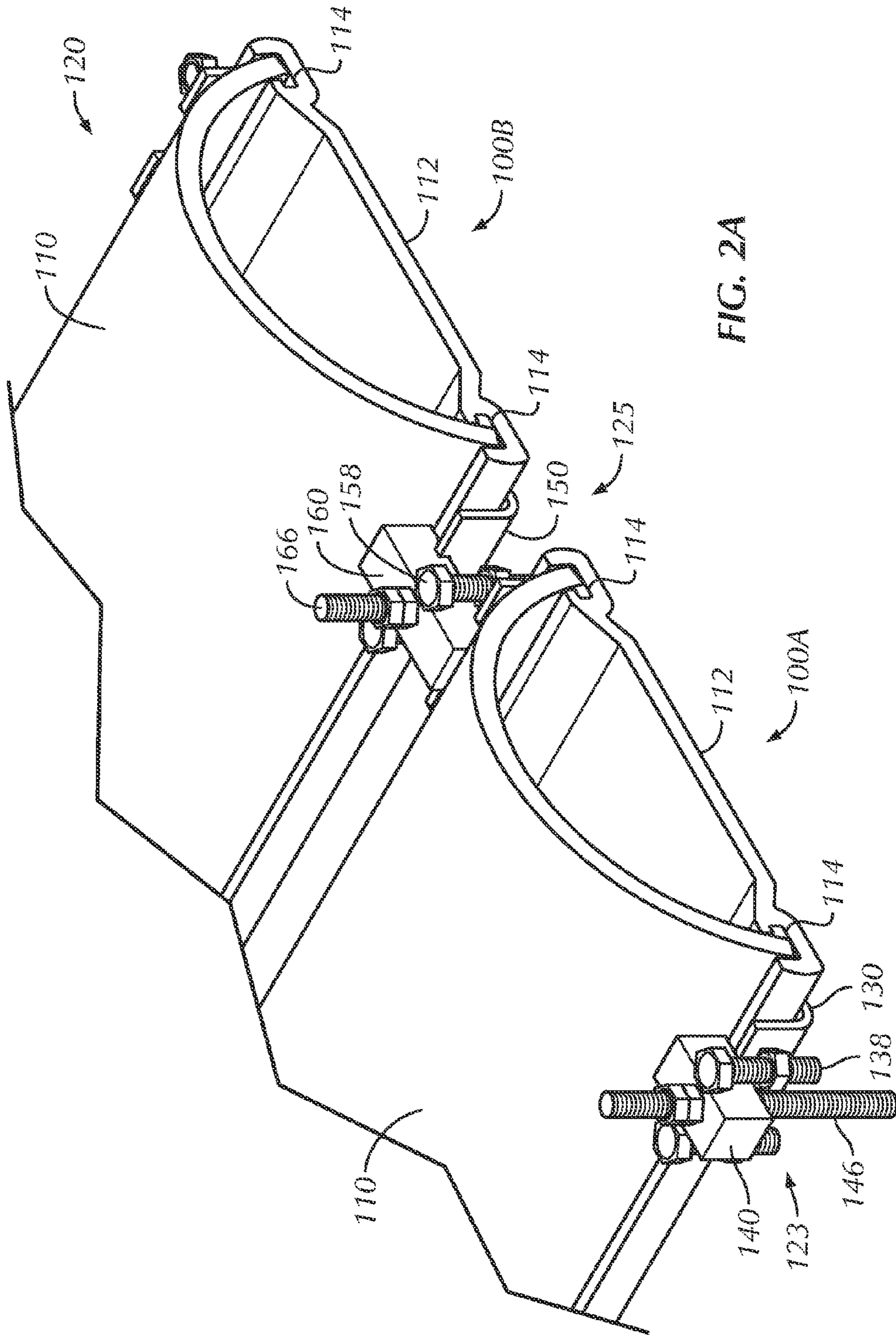


FIG. 2A

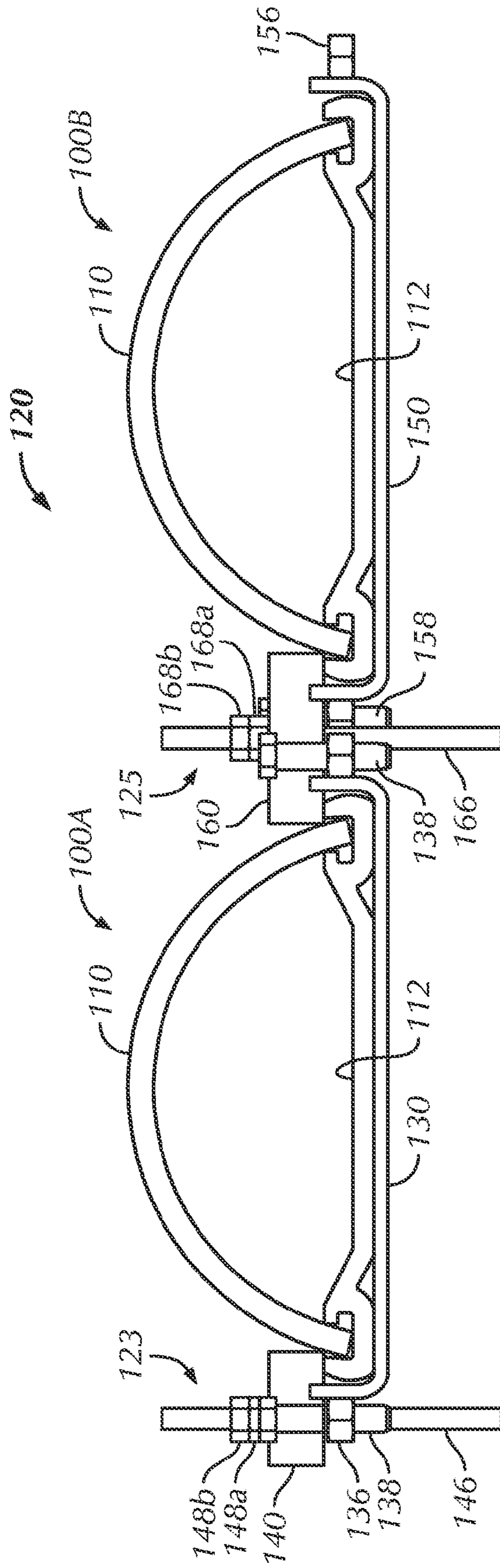


FIG. 2B

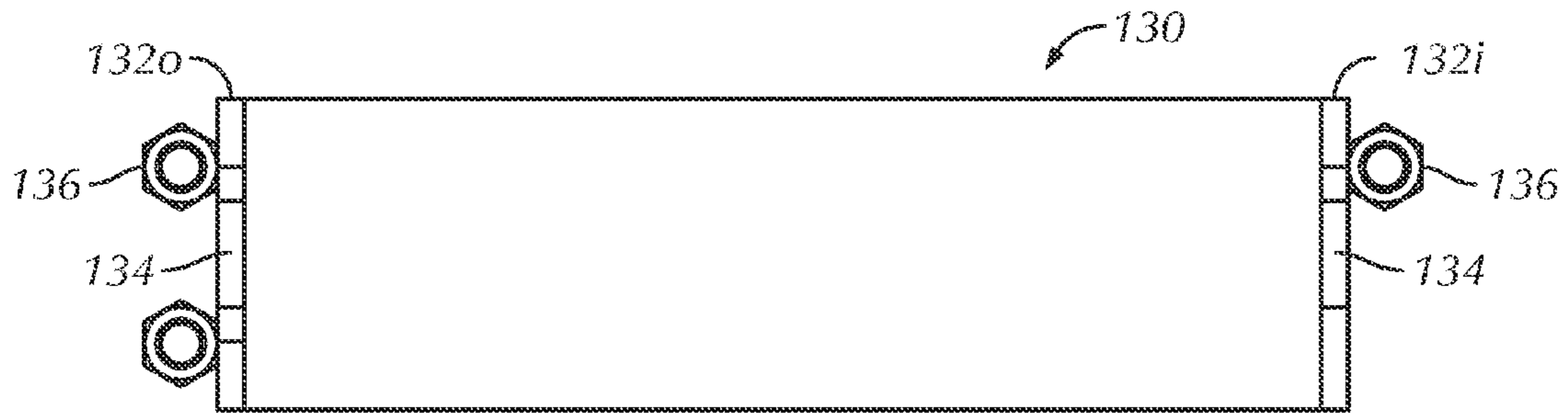


FIG. 3A



FIG. 3B

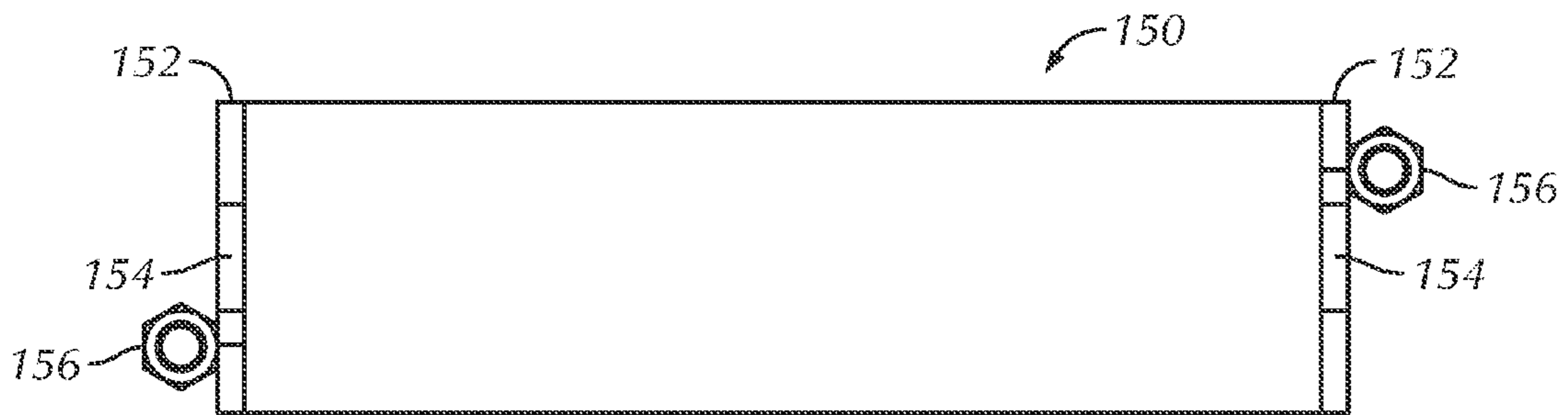


FIG. 4A



FIG. 4B

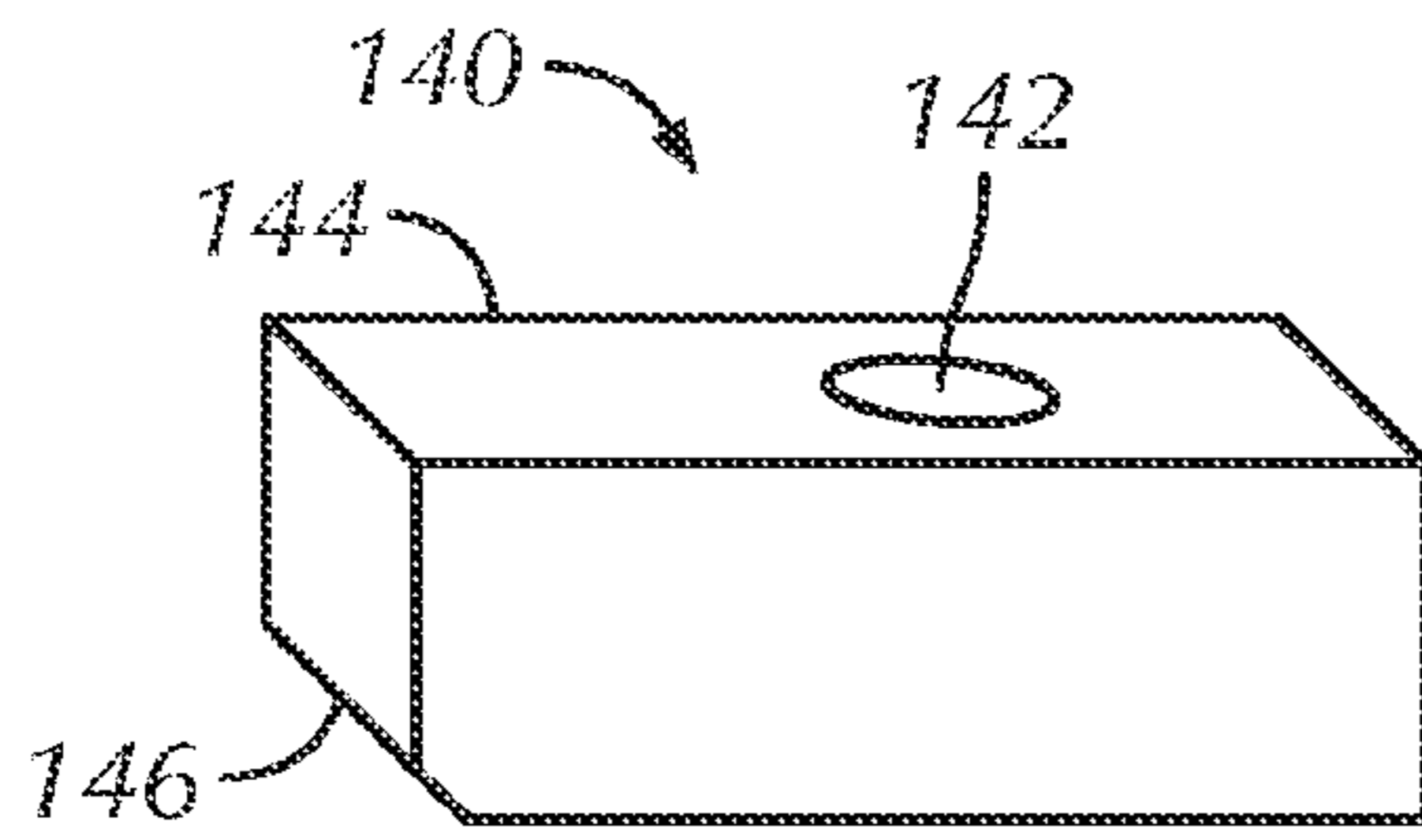


FIG. 5A

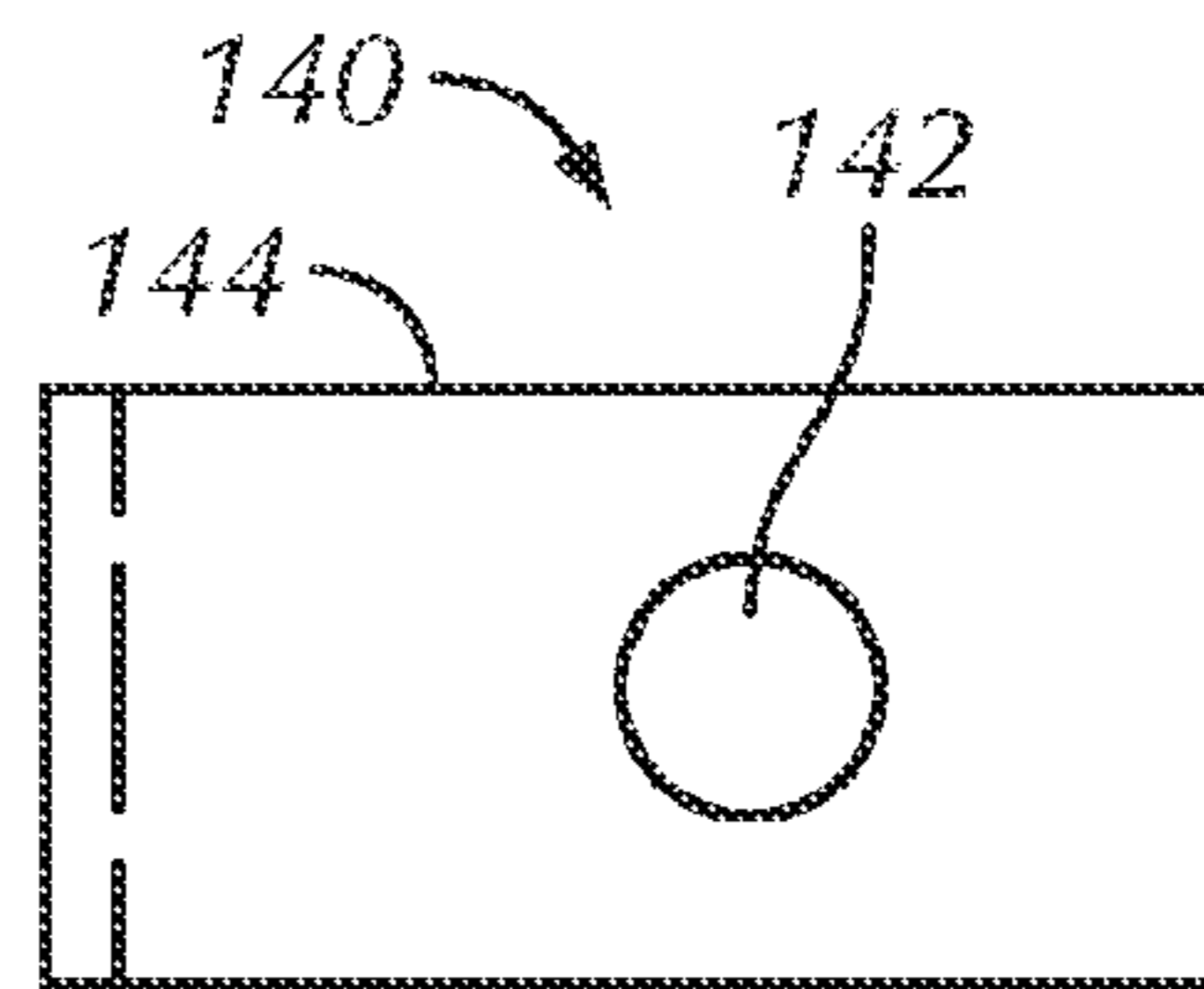


FIG. 5B

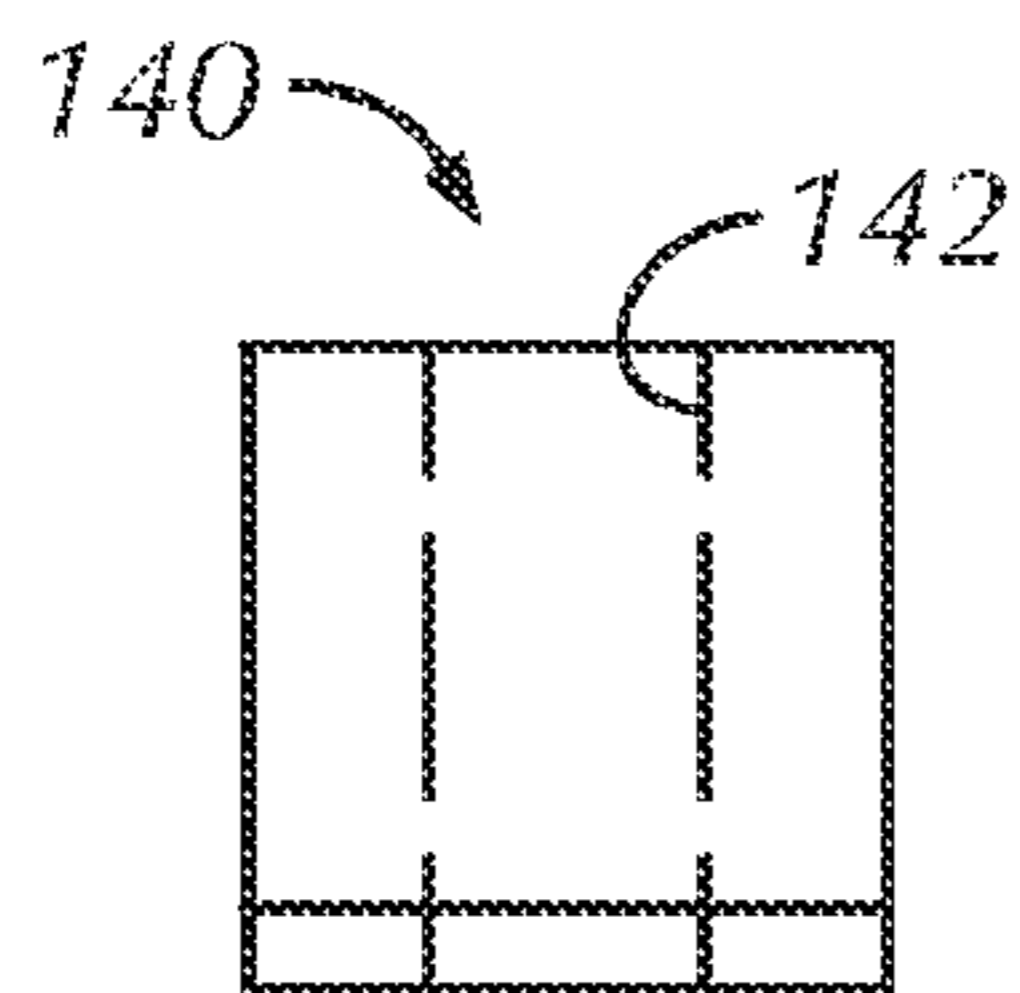


FIG. 5C

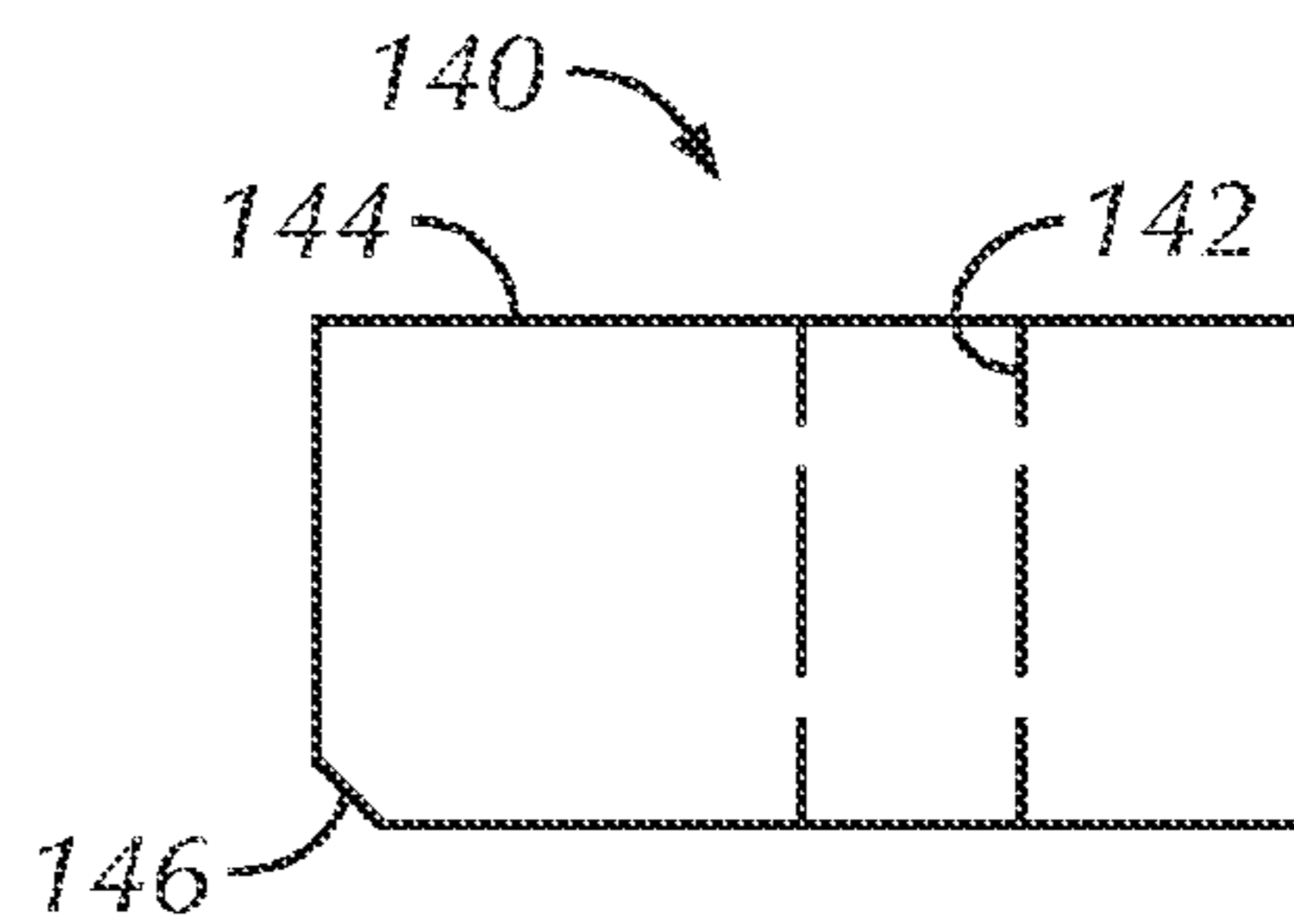


FIG. 5D

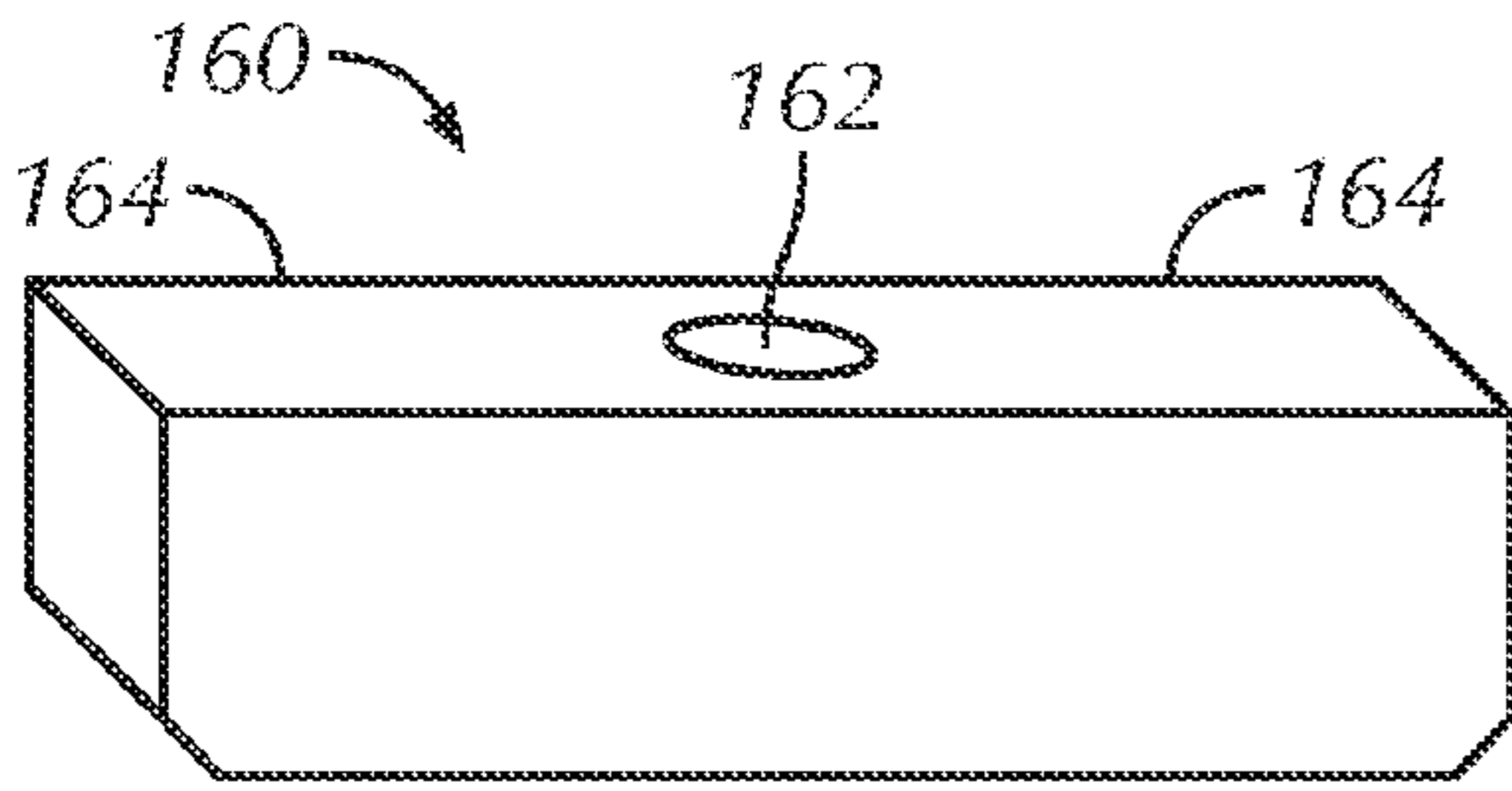


FIG. 6A

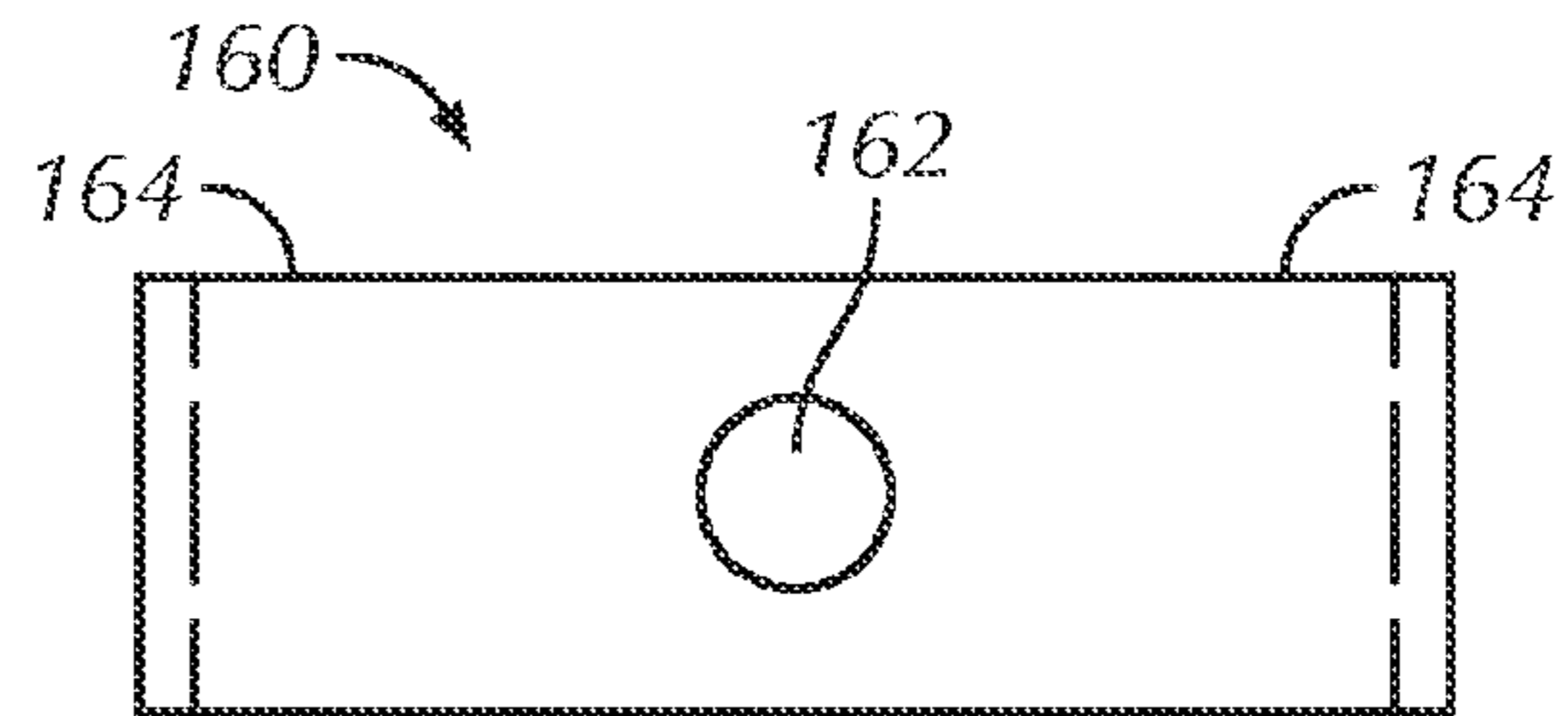


FIG. 6B

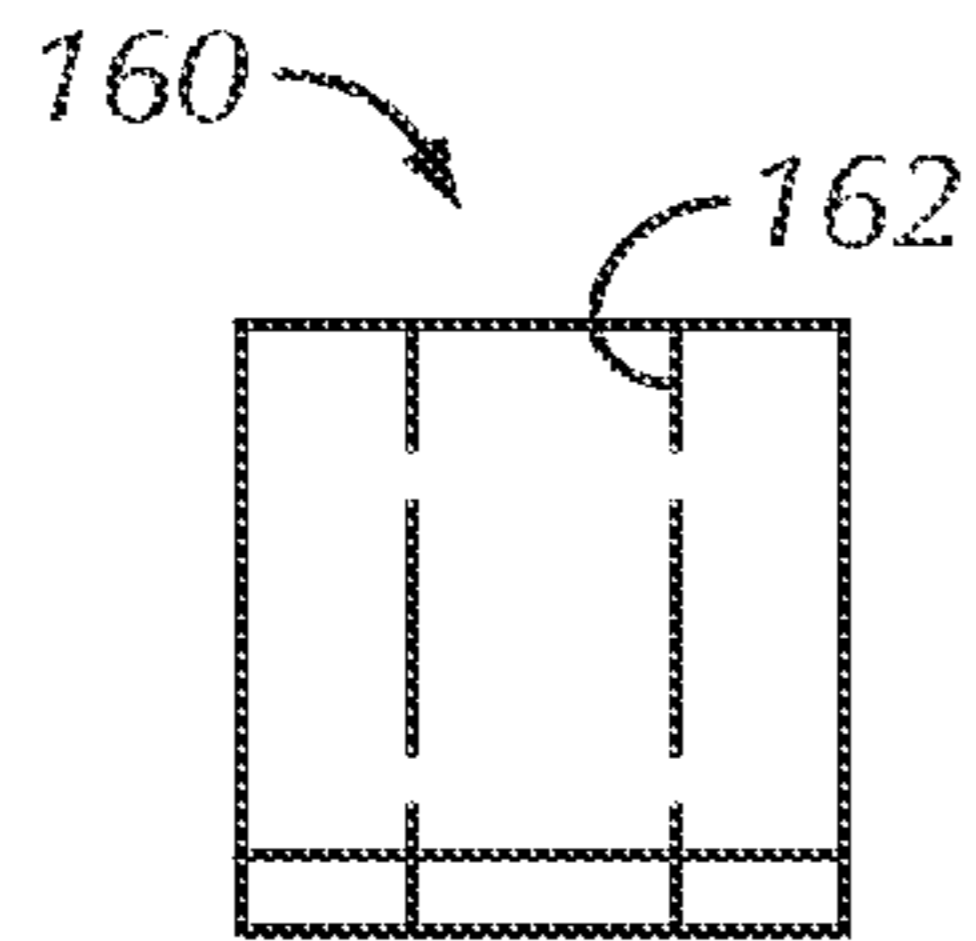


FIG. 6C

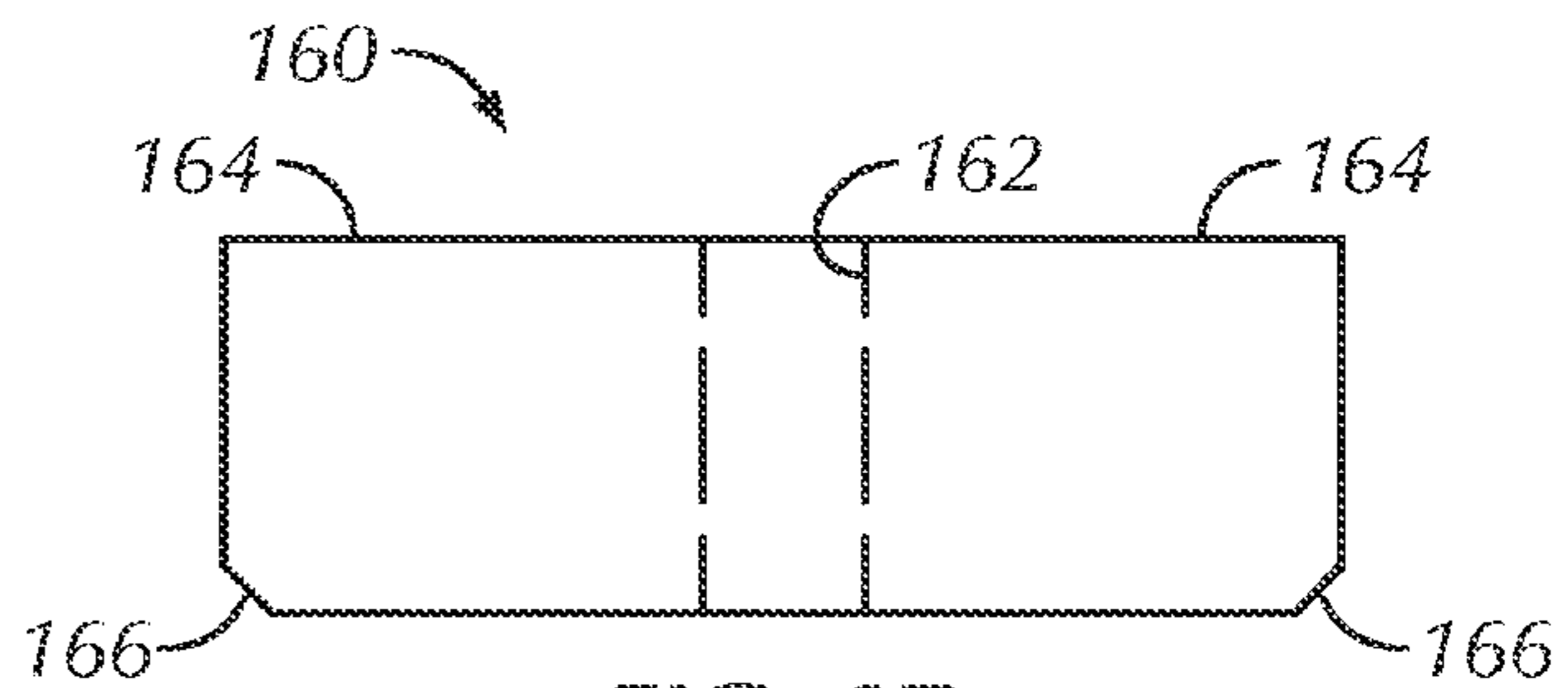


FIG. 6D

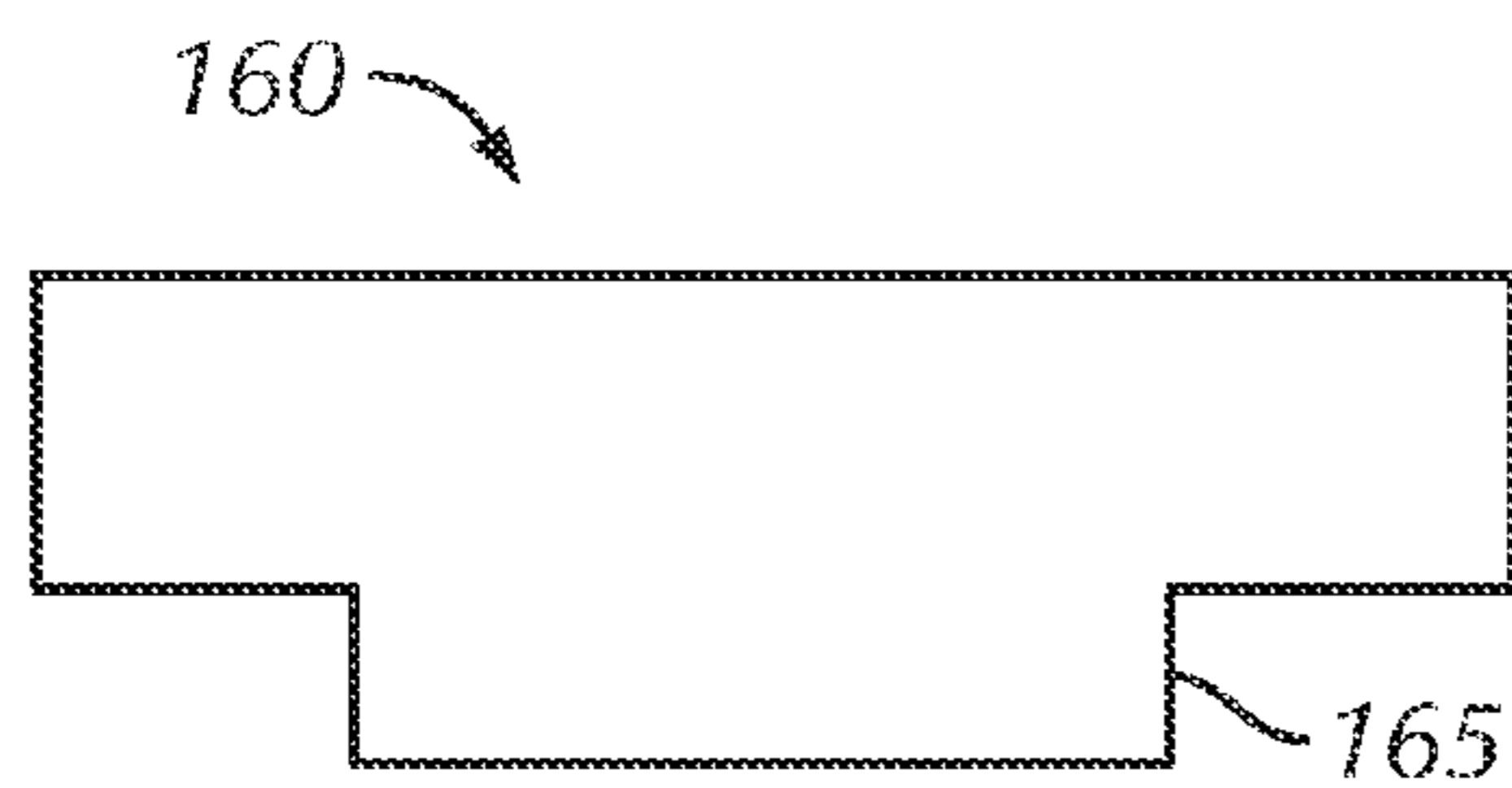


FIG. 7A

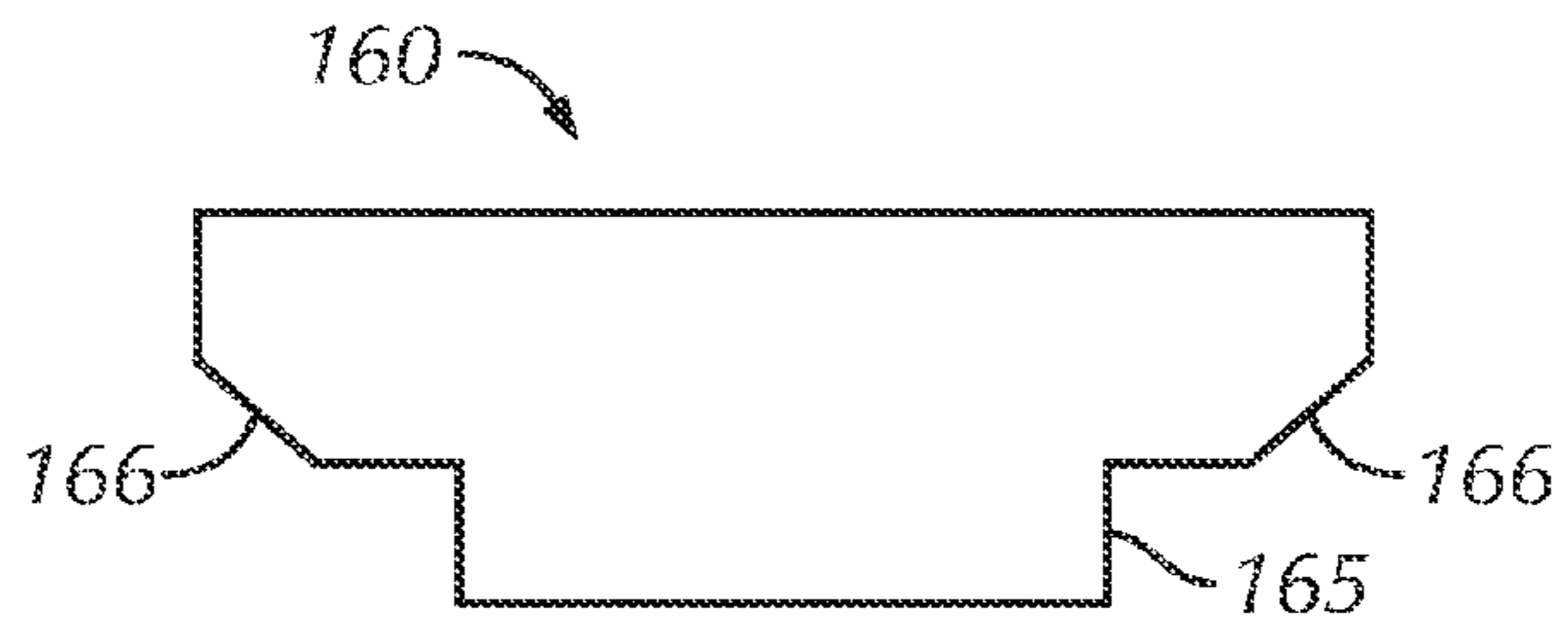


FIG. 7B

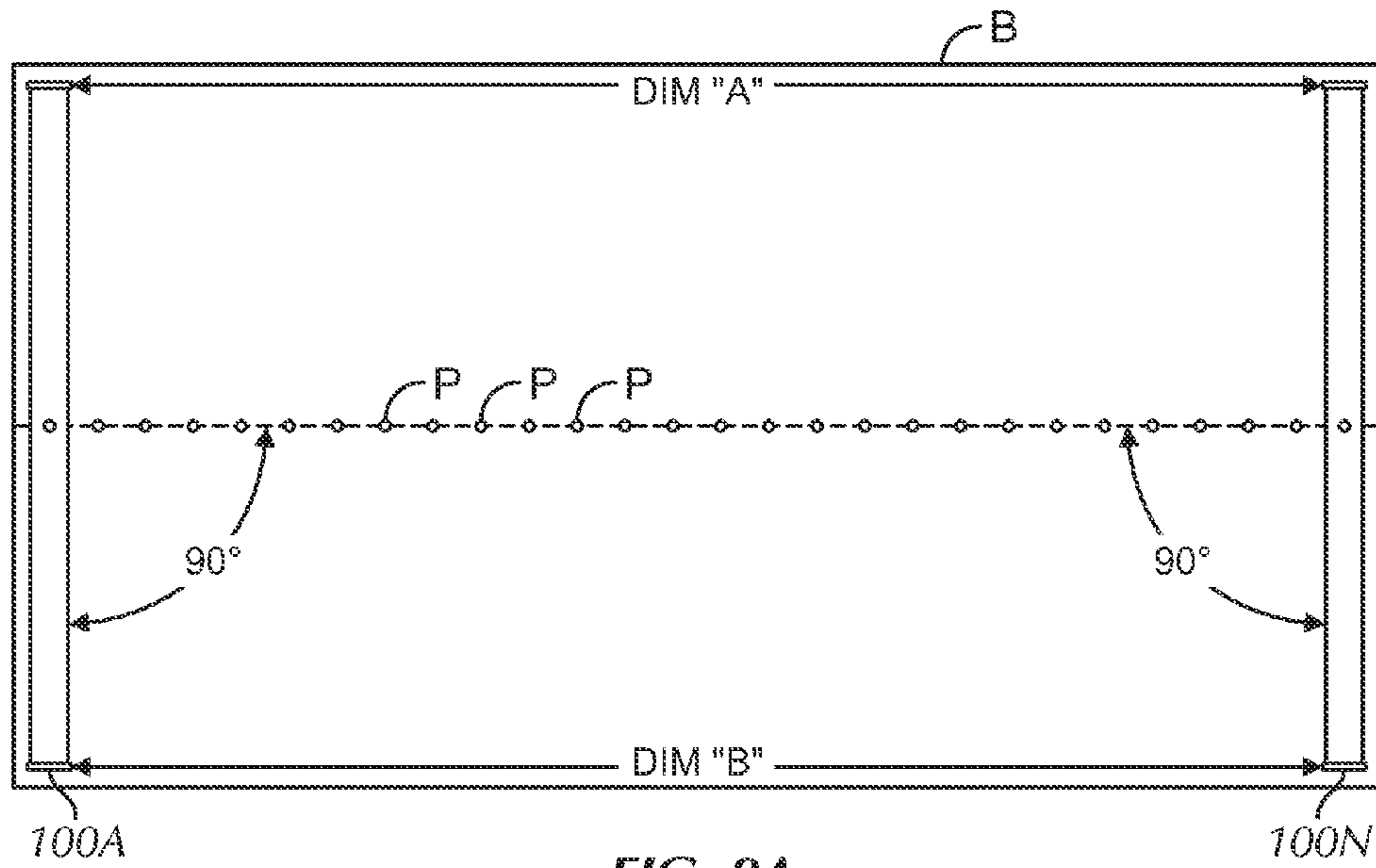


FIG. 8A

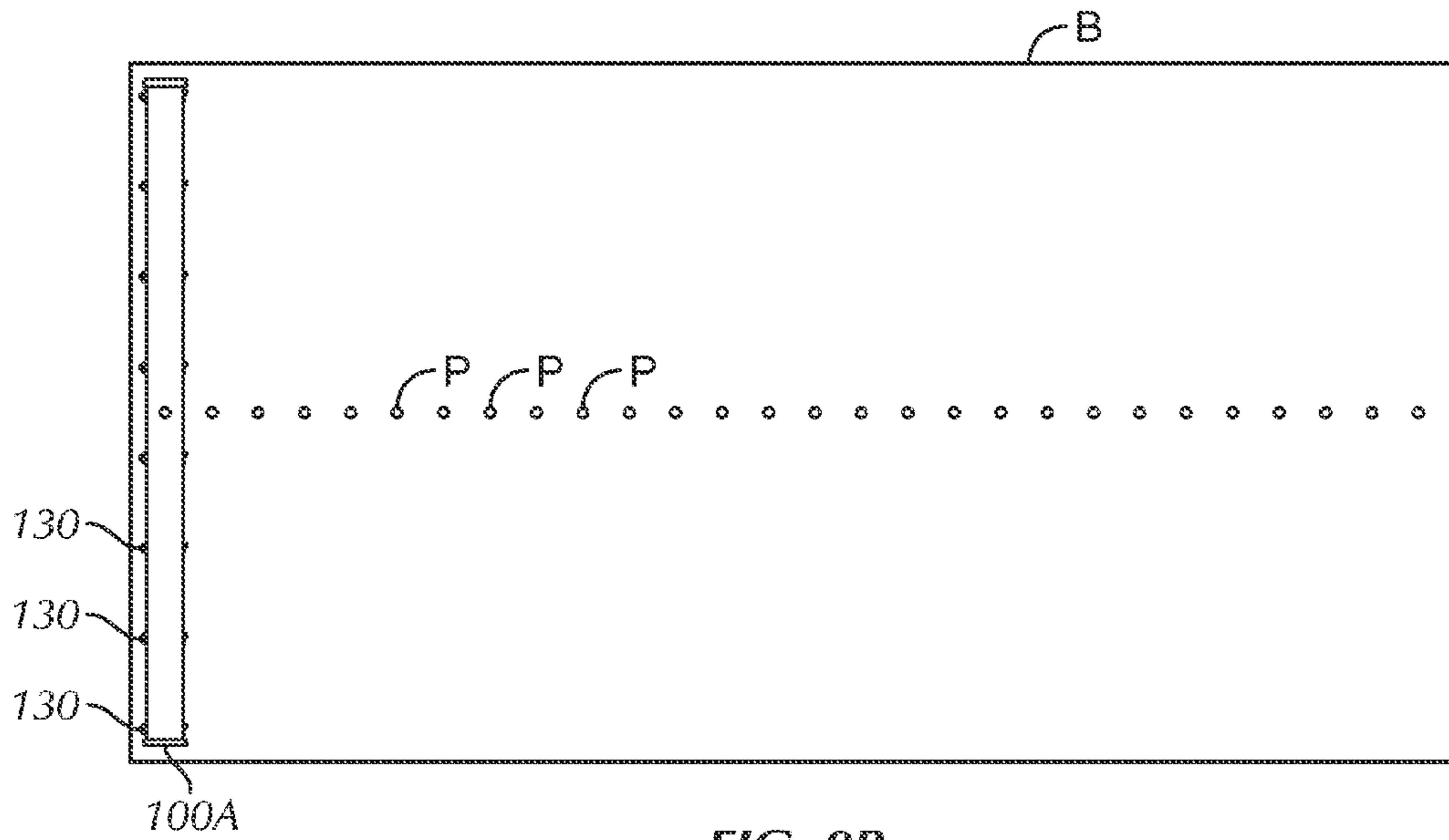


FIG. 8B

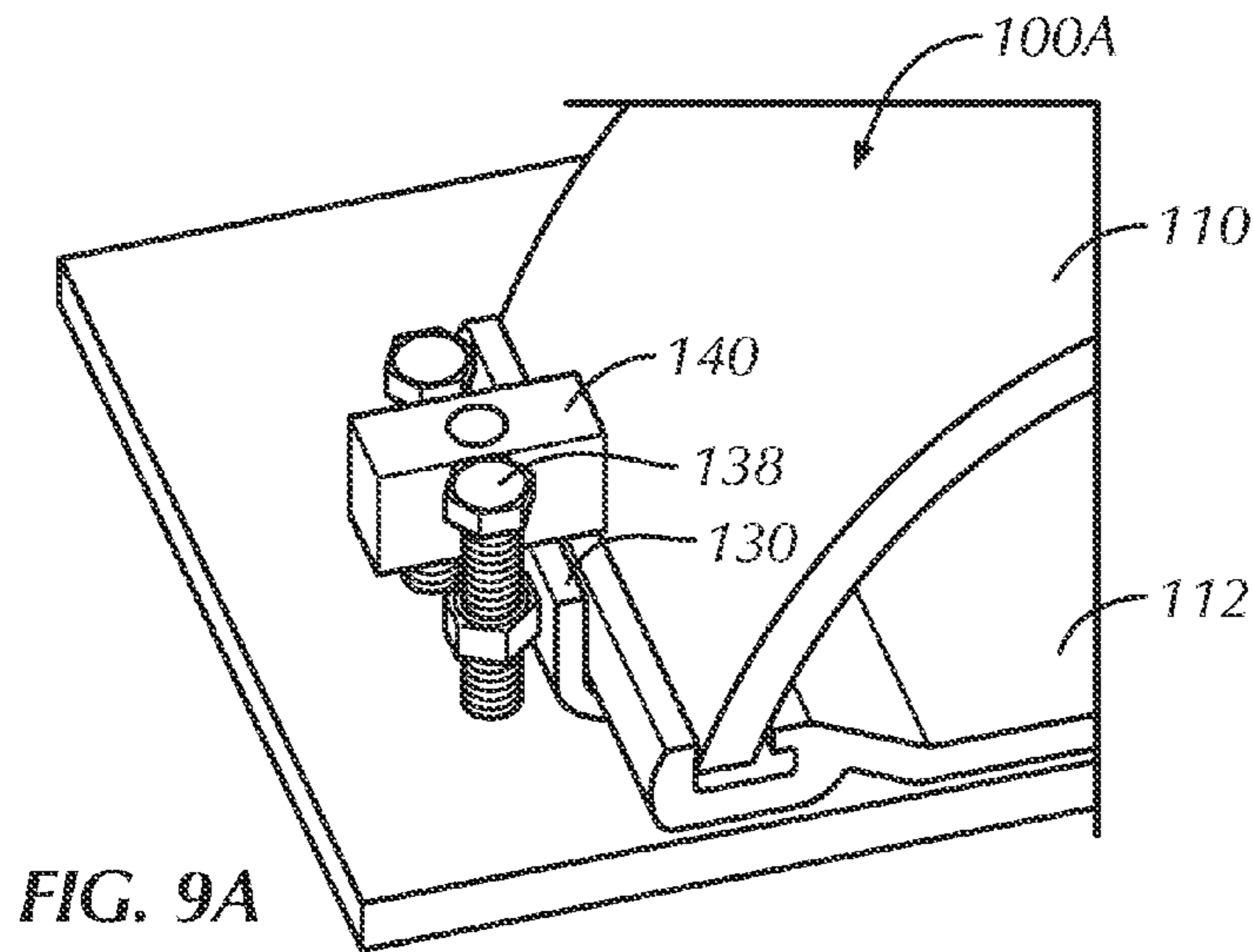


FIG. 9A

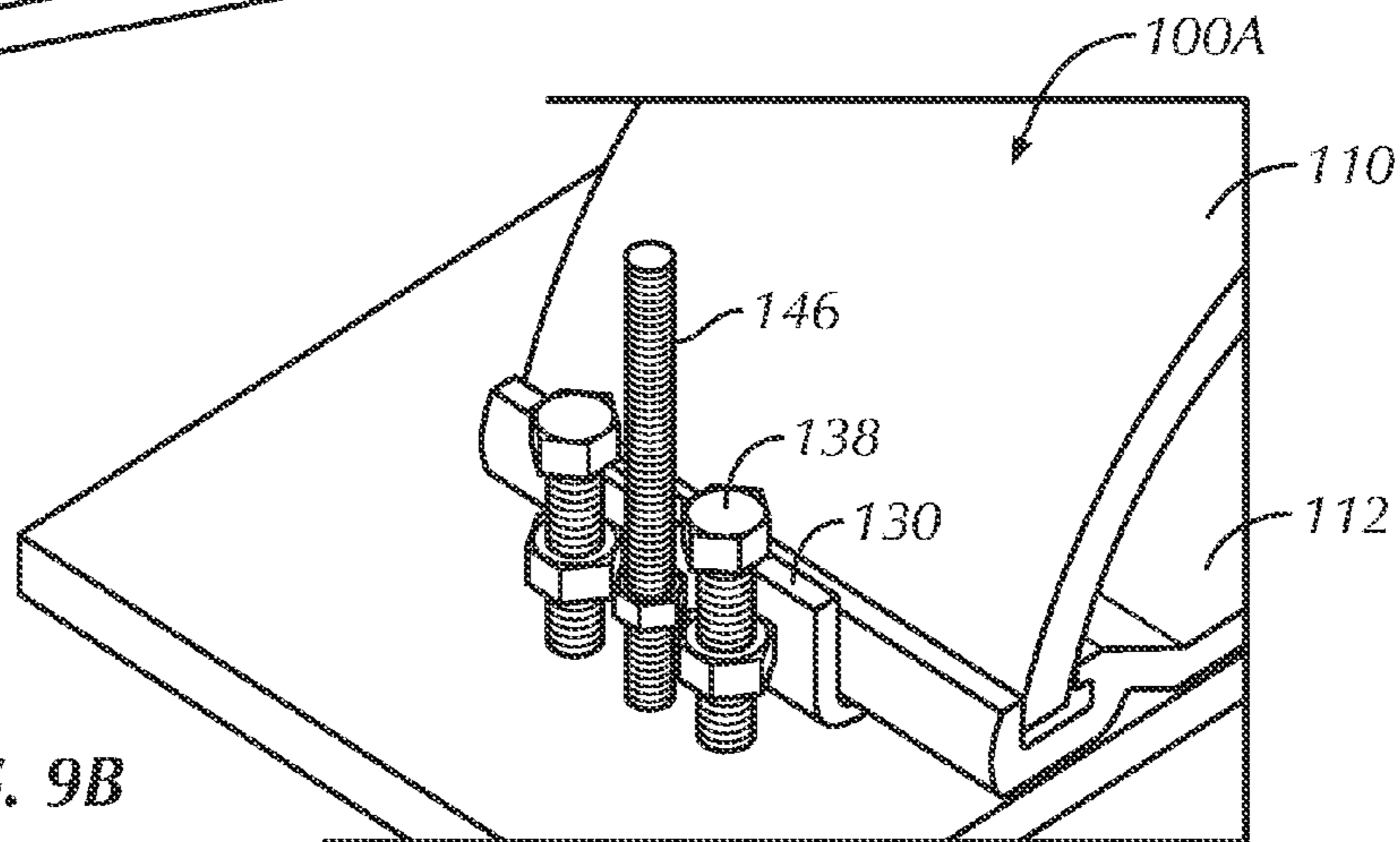


FIG. 9B

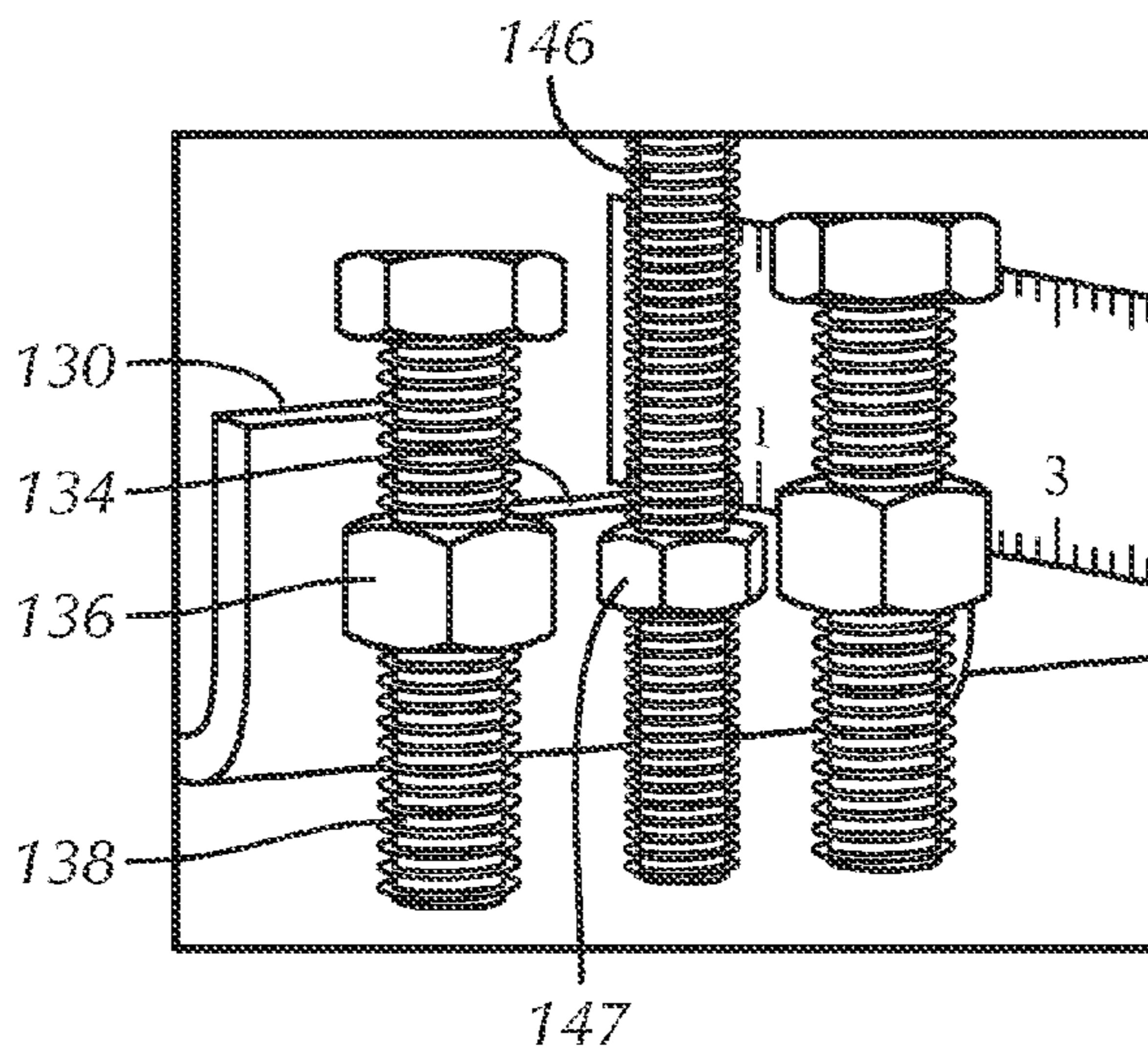


FIG. 9C

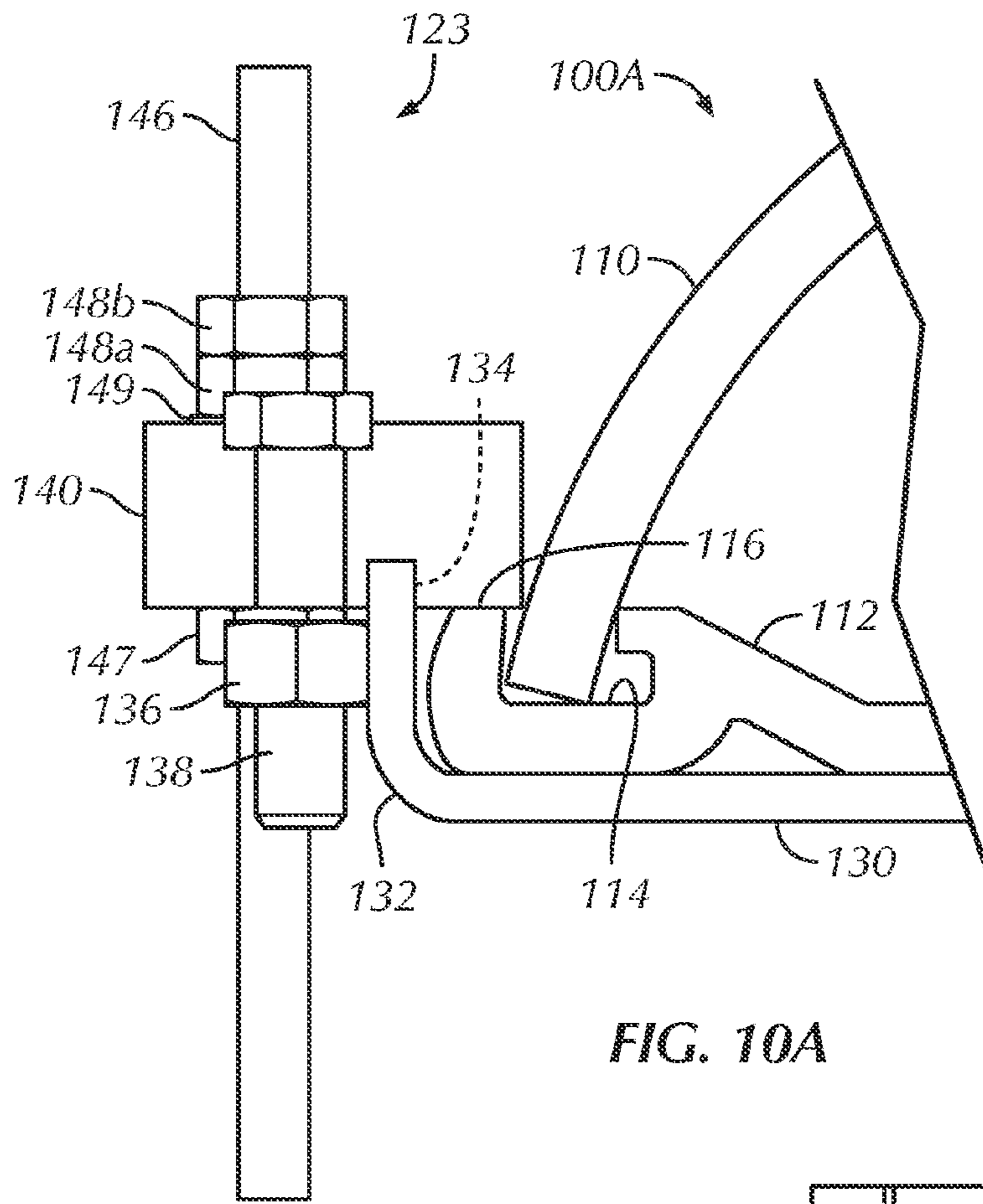


FIG. 10A

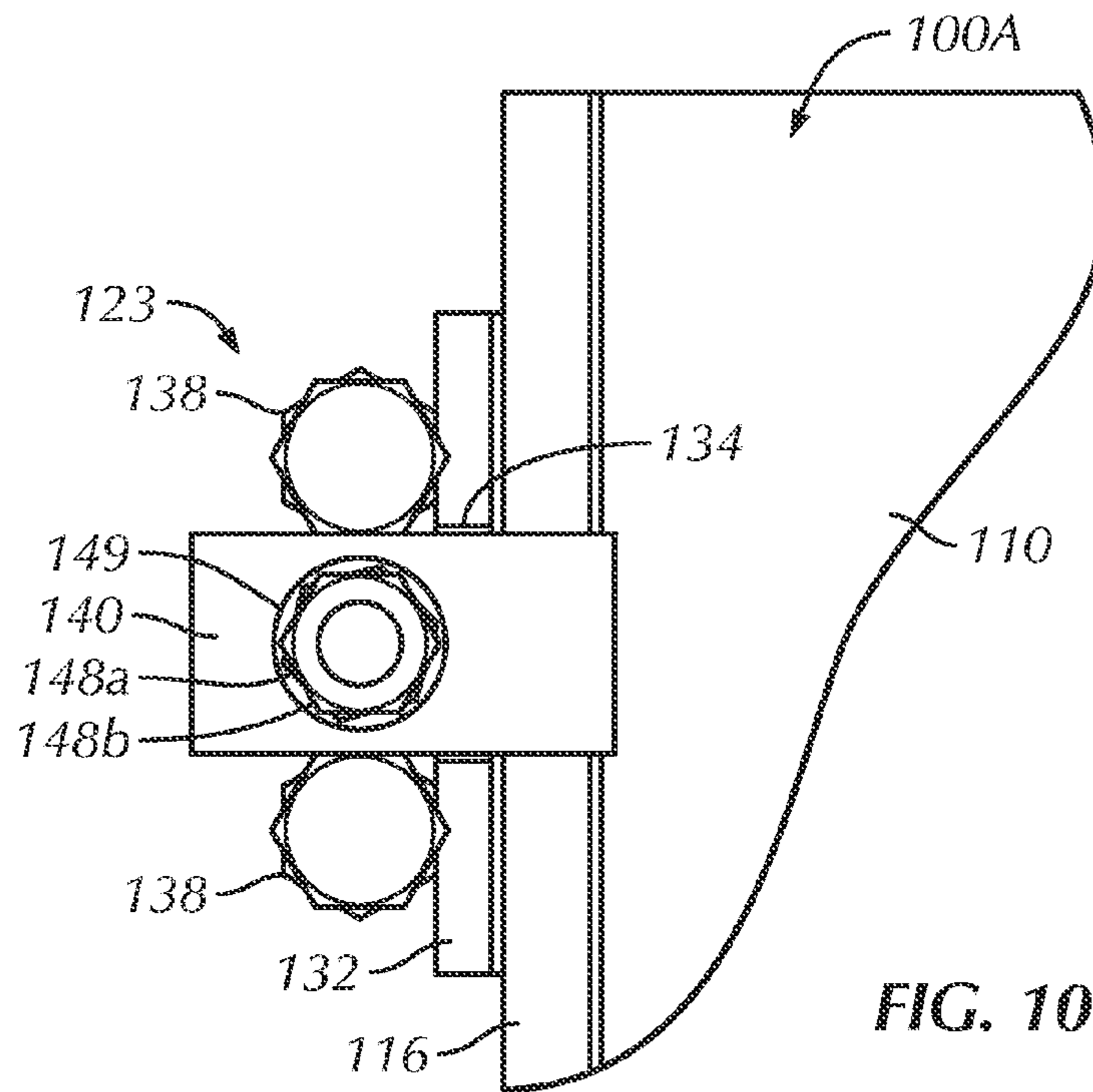


FIG. 10B

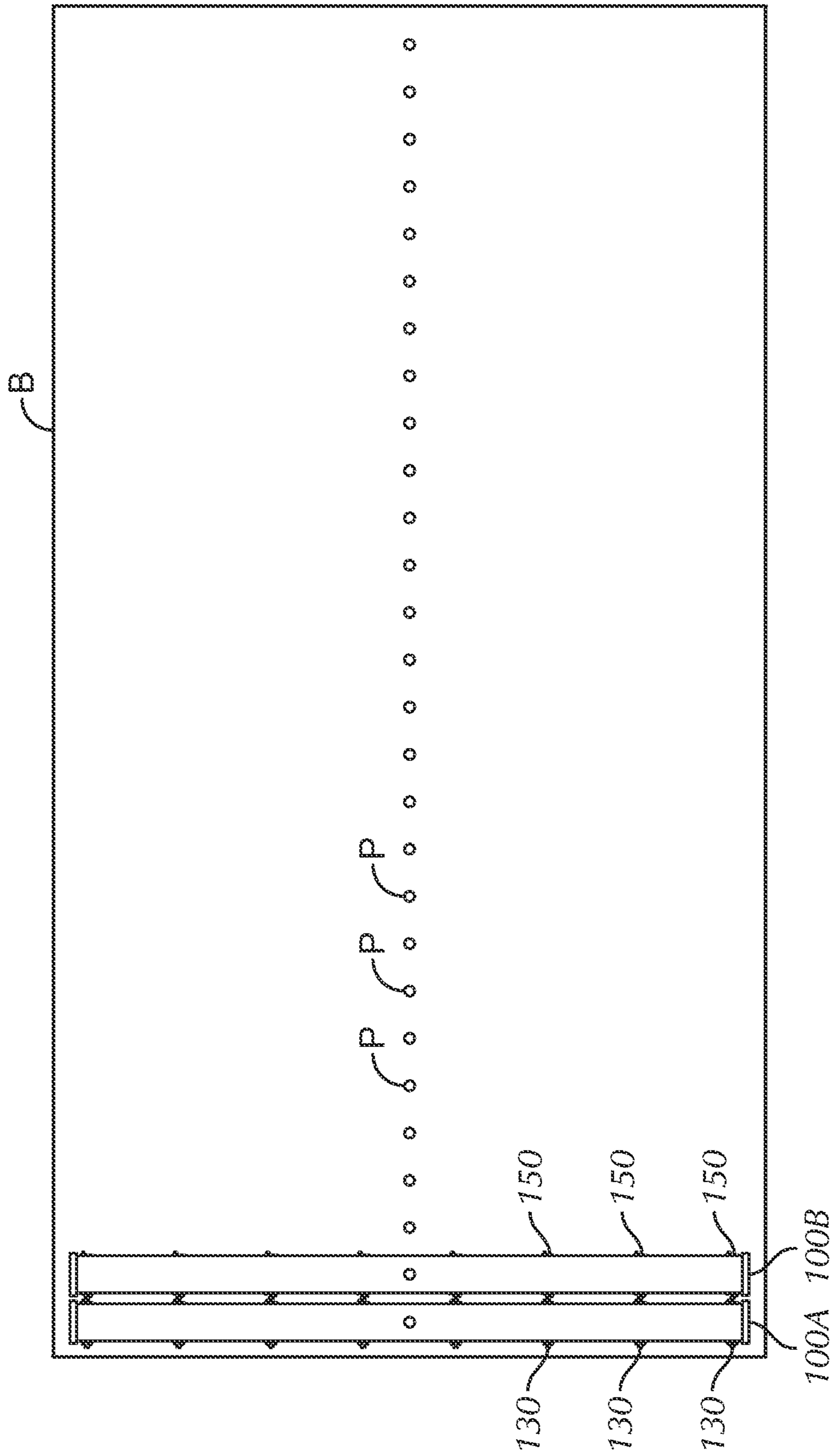


FIG. 11

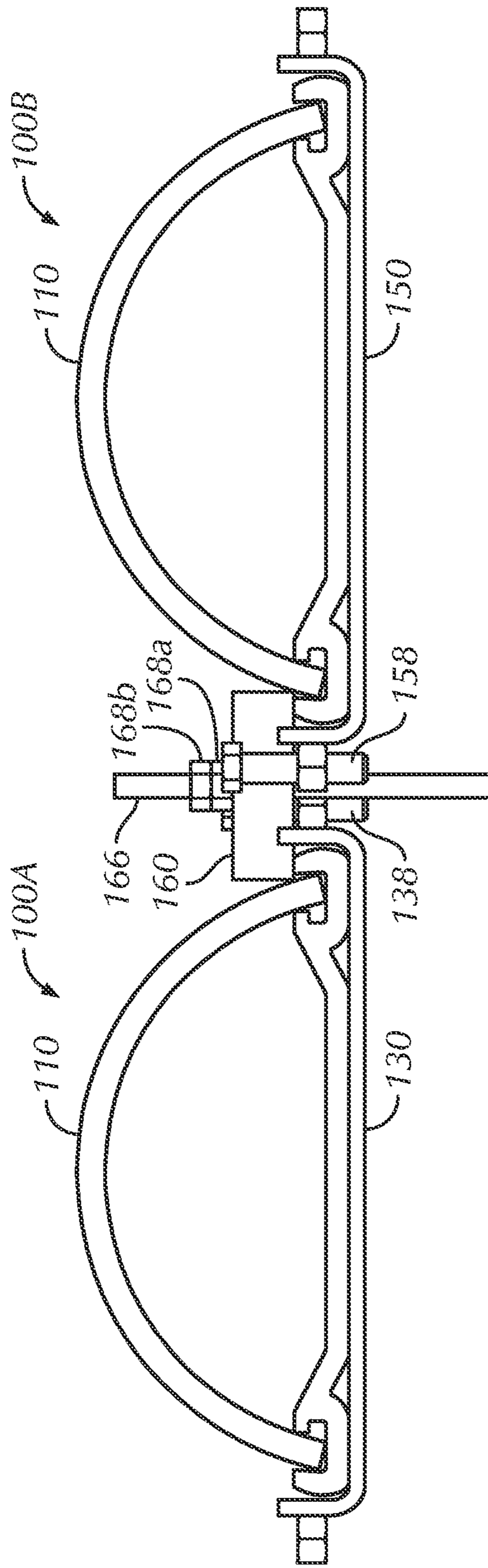


FIG. 12A

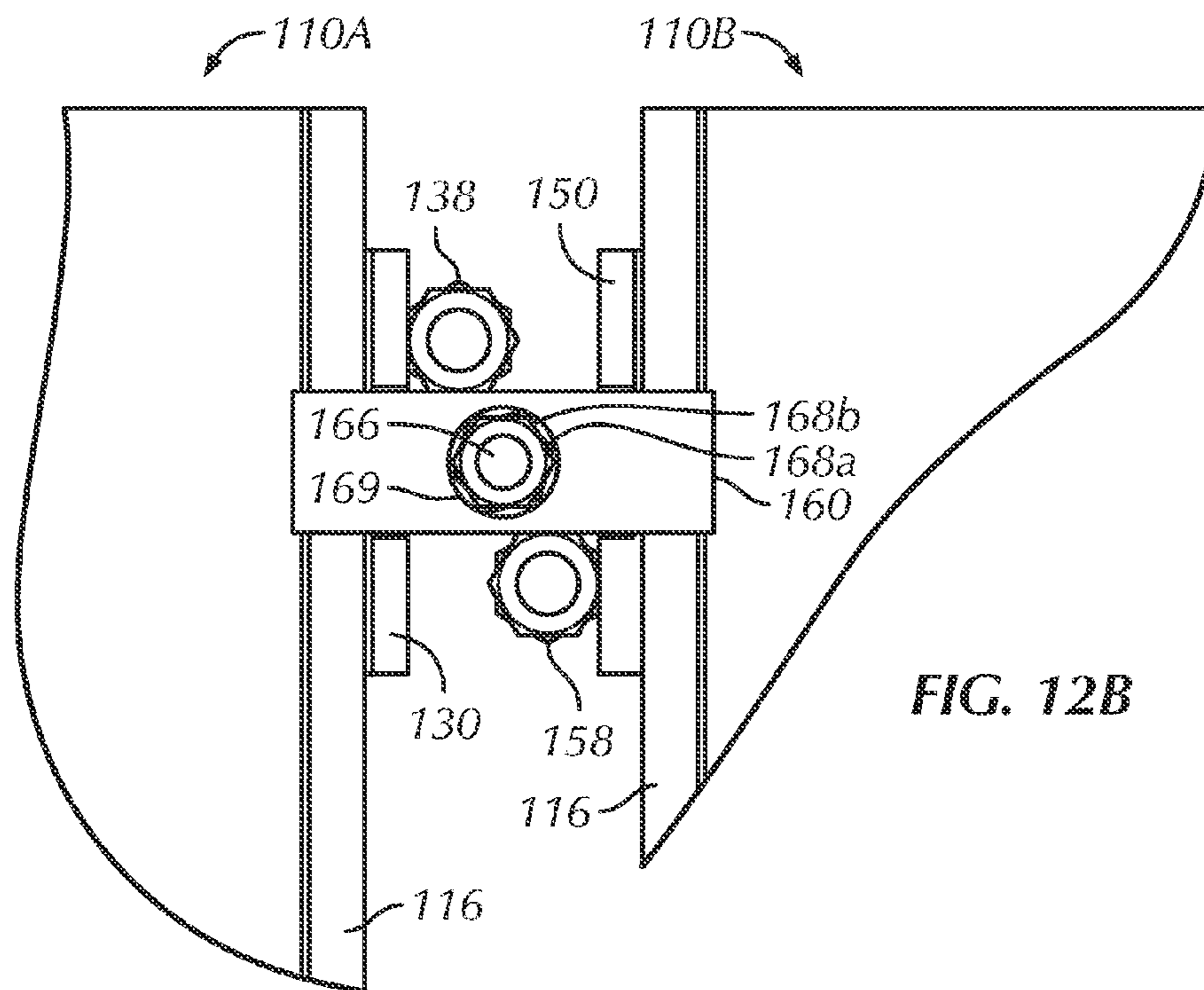


FIG. 12B

LEVELING HOLD-DOWN MECHANISM FOR LATERAL SCREENS

BACKGROUND

U.S. Pat. No. 5,156,738 to Maxson, which is incorporated herein by reference in its entirety, describes an underdrain system having a curved screen situated above a flat base plate. The underdrain system positions below a media bed so that liquid, usually water, exiting overflow troughs above the media bed can pass through the media.

During normal operation, water that has passed through the media bed falls into the underdrain system and into the screen, which has thin slots sized to retain particles that make up the media bed. Yet, water passing through the screen can be subsequently discharged from the underdrain system. As opposed to normal operation, a backwash mode can be used clean the media. In the backwash mode, water and air are directed upwardly through the screen and media bed in a uniform manner so that the material previously filtered out and captured by the media bed can be discharged through an overflow trough.

The underdrain system is formed of stainless steel and has its screen portion situated between two up-turned, side edge portions of its elongated flat base plate. Its screen portion is formed by helically winding and welding a metal wire to a channel base support as described in Geske U.S. Pat. No. 4,096,911, for example.

Screens and base plates that form lateral assemblies for underdrain systems can be quite large, often measuring as long as 30 feet, but they are more typically about 20 feet long. In the prior art, such lateral assemblies as described above have been formed of metal. Accordingly, these assemblies are difficult to transport and assemble due to their weight. Furthermore, where these metal assemblies are to be used with seawater or brackish water, they are subject to corrosion even when fabricated of stainless steel. In addition, because stainless steel is quite expensive, the base plates of these metal assemblies are usually relatively thin, allowing them to bow during use unless a substantial number of fixtures are provided to keep them in place and flat against the basin floor.

To overcome some of the challenges associated with such a metal lateral assembly, another underdrain screen is disclosed in U.S. Pat. No. 5,618,426, which is incorporated herein by reference in its entirety. As shown in FIGS. 1A-1B, the lateral screen **10** has a curved screen element **20** and a rigid extruded base plate **50**. The lateral screens **10** can be similar to the lateral screens of Johnson Screen's Triton® Underdrain System.

This screen **10** can be used in water treatment applications. When installed at the bottom of a water treatment basin, the lateral screen **10** collects and distributes water while directly retaining filtering media. The base plate **50** has a central opening **54** for a fitting seal **55** composed of nitrile or neoprene rubber, and the lateral screen **10** can be closed at its ends by molded plastic end caps **80**. When installed in a basin, the fitting seal **55** fits onto the end of a drop pipe (not shown) passing through the floor of the basin.

The screen element **20** slides into channels **52** along the longitudinal edges of the base plate **50**, which is composed of extruded polyvinylchloride (PVC). The screen element **20** is composed of PVC wire **40** (e.g., Vee-Wire®) wound around and welded to "U" shaped channel rods **30** at each intersection to the channel ribs **34**. (VEE-WIRE is a registered U.S. trademark of Weatherford/Lamb, Inc.) The screen element **20** can also be made of other materials, such as stainless steel or as required by the process in which the screen will be used.

On the screen element **20**, the wires **40** and ribs **30** define small openings for the retention of media and collection of filtered liquid. During fluid flow, the small openings cooperate with each other to form a flow distribution system for uniformly controlling the flow of water and air passing into and out of the screen element **20**.

In some implementation, it is desirable for the underdrain screen **10** to have an extended length. However, such a longer screen **10** needs additional leveling and hold down capability due to higher variations in the flatness of the basin floor in the larger basins the longer screens **10** will be installed. Typically, this will be for larger water treatment or desalination plants.

In smaller installations, the variation on the floor height of the basin is typically specified to be within ¼". This has allowed the underdrain screens **10** to be successfully installed and used without the need for sophisticated leveling. For larger basins, however, it can be difficult to maintain the ¼" tolerance in flatness. In some cases, shims or other spacer systems must be placed under the underdrain screens **10** by installers.

Stainless steel underdrain screens can have a leveling screw welded to the side of the screens to allow them to be leveled for larger basins. The tops of these leveling screws are held down by a channel, which both holds the underdrain screens in place and prevents the leveling screws from moving during operation. This form of leveling and hold down is not available for screens made of plastic, such as PVC.

Instead, as shown in FIG. 1C, the common way of leveling and retaining underdrain lateral screens **10** of plastic in a basin B uses shims **70** and upper hold-down bars **60**. Operators fit the shims **70** underneath the screens **10** where needed along their length to level them. To hold down the screens **10**, operators install the angle hold-down bars **60** over the top of the lateral screens **10**. These bars **60** affix by anchor bolts **65** in the basin floor and run perpendicular to the length of the lateral screens **10**.

The subject matter of the present disclosure is directed to overcoming, or at least reducing the effects of, one or more of the problems set forth above.

SUMMARY

A leveling hold-down mechanism is used with lateral screens on the floor of a basin having drop pipes. The lateral screens are composed of plastic, such as PVC, or other non-metallic material. The mechanism includes inner and outer assemblies. The outer assembly supports the lateral screens at the ends of the adjacent rows of lateral screens situated on the basin floor. The inner assemblies support between the adjacent lateral screens laying side-by-side on the basin floor.

The outer assembly has support plates with two nuts affixed on an outer edge for adjustment bolts and one nut affixed on an inner edge for an adjustment bolt. These support plates fit underneath the lateral screen along its length, and outer hold-down bars fit onto anchor bolts affixed to the basin floor using known techniques. The edges of these bars hold against the outer edge of the lateral screen's base.

The inner assembly also has support plates, but these have one nut alternately affixed on each edge of the plates for adjustment bolts. These support plates fit underneath a lateral screen along its length when positioned next to another lateral screen. Inner hold-down bars fit onto anchor bolts affixed to the basin floor using known techniques. The edges of these bars hold against the outer edges of the lateral screens' bases. The mechanism allows for individual leveling of the lateral screens at closer intervals, which results in easier (i.e., less costly) and more precise installation.

The foregoing summary is not intended to summarize each potential embodiment or every aspect of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is an end-sectional view of a lateral screen assembly according to the prior art.

FIG. 1B is a side view of the lateral screen assembly.

FIG. 1C is a perspective view of lateral screens installed in a basin with prior art hold down bars.

FIG. 2A-2B are perspective and end views of lateral screens having a leveling hold-down mechanism according to certain teachings of the present disclosure.

FIGS. 3A-3B show top and side views of an outer leveling plate of the disclosed mechanism.

FIGS. 4A-4B show top and side views of an inner leveling plate of the disclosed mechanism.

FIGS. 5A-5D are perspective, top, end, and side views of an outer hold-down bar.

FIGS. 6A-6D are perspective, top, end, and side views of an inner hold-down bar.

FIGS. 7A-7B show side views of alternate hold-down bars.

FIGS. 8A-8B shows a plan view of a basin having drop pipes and arrangements of lateral screens during assembly procedures.

FIGS. 9A-9C show steps for assembling the outer hold-down plate and bar on a lateral screen.

FIGS. 10A-10B show side and plan views of the outer hold-down plate and bar installed on a lateral screen.

FIG. 11 shows a plan view of the basin having a subsequent arrangement of lateral screens during assembly procedures.

FIGS. 12A-12B show side and plan views of the inner hold-down plate and bar installed on lateral screens.

DETAILED DESCRIPTION

FIGS. 2A-2B show perspective and end views of lateral screens 100A-B having a leveling hold-down mechanism 120 according to certain teachings of the present disclosure. The mechanism 120 helps maintain the lateral screens 100A-B in a level state and holds them in place during normal operation (downflow) and backwash (upflow) in an underdrain system. The lateral screens 100A-B can be similar to the lateral screens of Johnson Screen's Triton® Underdrain System.

In use, the lateral screens 100A-B collect and distribute water while directly retaining filtering media. To do this, each lateral screen 100 has a screen element 110 that slides into channels 114 along the longitudinal edges 116 of a base plate 112. Although not shown, the screen element 110 is composed of PVC Vee-Wire® wound around and welded to "U" shaped channel rods as described previously. In addition, the base plate 112 is composed of extruded PVC and has a central opening (not shown) for affixing on a drop pipe with a seal or the like. The screen element 110 can also be made of other materials, such as stainless steel or as required by the process in which the screen will be used.

The mechanism 120 uses two different hold-down assemblies 123/125 for an installation depending on the location of the lateral screens 100A-B in a basin. An outer hold-down assembly 123 has an outer leveling plate 130 with leveling bolts 138 and has an outer hold-down bar 140 with an anchor bolt 146. Because the screens 100A-B are normally installed side-by-side on the basin floor, the outer hold-down assembly 123 is used for the end or last screen 100A on either end of the basin as described in more detail below. An inner hold-down assembly 125 has an inner leveling plate 150 with leveling

bolts 158 and has an outer hold-down bar 160 with an anchor bolt 166. This inner hold-down assembly 125 is used between lateral screens 100A-B on the basin floor as described in more detail below.

The plates 130/150, bars 140/160, bolts 138/158, and the like are separate components from the lateral screens 100A-B, rather than being welded/attached to them. This allows for easier adjustment and placement of the screens 100A-B during installation. It also allows for more accurate leveling of the plastic lateral screens 100A-B, which are typically leveled using shims in the less reliable manner of the prior art.

As generally shown in FIGS. 2A-2B and described in more detail below, the leveling plates 130/150 support the bottom of the lateral screens 100A-B at appropriate intervals along their length. The spacing between plates 130/150 along the length of a screen 100 is dependent on the weight of the water and media in the basin and the expected hydraulic forces encountered during backwash. Leveling bolts 138/158 on the sides of the plates 130/150 can be used to raise the plates 130/150 and the supported section of the screens 100A-B to effectively level the screens 100A-B.

The threaded anchor bolts 146/166 are placed next to or between the screens 100A-B depending on their location in the basin, and hold-down bars 140/160 are placed on the threaded anchor bolts 146/166. A nut/washer arrangement then clamps the bars 140/160 to the screens 100A-B and the plates 130/150. The bars 140/160 are sized and positioned in such a way as to restrict any turning motion of the adjacent leveling bolts 138/158.

The components of the mechanism 120 can be made of a variety of materials so that any special alloys can be used when required in desalination plants or other corrosive environments. The components of the mechanism 120 can also be standardized and can be used in many installations without modification. In the end, the mechanism 120 enables the plastic lateral screens 100A-B to be used in applications where they could not be used previously because the plastic lateral screens 100AB could not be adequately held down and leveled with prior art systems.

As shown in FIGS. 3A-3B, the outer leveling plate 130 has upward extending sides or edges 132*o-i* defining notches 134 on top. A number of nuts 136 weld to the sides 132*o-i*, although other ways of including threading openings in the sides 132*o-i* could be used. In particular, the outer side 132*o* has two nuts 136 on either side of the notch 134, while the inner side 132*i* has one nut 136 on one side of the notch 134. As shown previously in FIGS. 2A-2B, adjustment bolts 138 install in these side nuts 136 for adjusting the level of the plate 130 when disposed on a basin floor as described below.

As shown in FIGS. 4A-4B, the inner leveling plate 150 also has upward extending sides or edges 152*o-i* defining notches 154 on top. A number of nuts 156 weld to the sides 152*o-i*, although other ways of including threading openings in the sides 152*o-i* could be used. In particular, the outer side 152*o* has one nut 156 on one side of the notch 154, while the inner side 152*i* has one nut 156 on the opposite side of the notch 154. As shown previously in FIGS. 2A-2B, adjustment bolts 158 install in the side nuts 156 for adjusting the level of the plate 150 when disposed on a basin floor as described below.

As shown in FIGS. 5A-5D, the outer hold-down bar 140 has a through-hole 142 that is off center and toward an outer edge. An extended end 144 of the bar 140 can be used for holding down an edge 116 of a lateral screen 100 as shown previously in FIGS. 2A-2B, for example. The inner edge of the bar 140 can have a chamfer 146 so as not to damage the screen element 110.

5

As shown in FIGS. 6A-6D, the inner hold-down bar **160** has a through-hole **162** defined in the center. Extended ends **164** on either side of the hole **162** can be used for holding down edges **116** of adjacent lateral screens **100A-B** as shown previously in FIGS. 2A-2B, for example. Both edges of the bar **160** can have a chamfer **166** so as not to damage the screen elements **110**.

In some other variations shown in FIGS. 7A-7B, the inner hold-down bar **160** can have a central rim to center it when installed in the assembly between the adjacent support plates. Also, the outside edges of the bar **160** can be tapered as in FIG. 7B to avoid or enhance contact with the screen (not shown).

With an understanding of the components of the leveling hold-down mechanism **120**, discussion now turns to steps for installing lateral screens **100A-B** with the mechanism **120** in a basin. Initially, operators install the leveling bolts **138/158** into the hold-down plates **130/150** so that distal ends of the bolts **138/158** are flush with the bottom surfaces of the plates **130/150**.

As shown in FIG. 8A, operators place the first and last lateral screens **100A** and **100N** onto the floor of the basin B at opposing ends. The bases **112** of the screens **100** affix to the ends of the drop pipes P using known procedures and attachments not detailed herein. The screens **100A** and **100N** are positioned so that they are perpendicular to the arranged line of drop pipes P that pass through the floor of the basin B. Once perpendicular to the drop pipes P, operators verify that there is no interference with the basin's walls on either lateral screen **100A** and **100N**. Next, operators measure between the two screens **100A** and **100N** on each end to verify that the ends are separated by an equal distance (i.e., DIM "A" should equal DIM "B").

Next, as shown in FIG. 8B, operators install the outer hold-down plates **130** with its flush adjustment bolts **138** underneath the first lateral screen **100A** on the end of the basin B. Working down the length of the first lateral screen **100A**, operators mark out the outer hole locations for the anchor bolts **146**. While marking the locations, operators verify that plates **130** are perpendicular to the lateral screen **100A**.

As shown in FIG. 9A, operators use the outer hold-down bar **140** as a guide to mark the locations of the holes to be drilled for the anchor bolts (**146**). For proper placement, the outer hold-down bar **140** is preferably placed at least past the halfway point on the edge **116** of the screen's base plate **112**, but not in contact with the screen element **110**. As expected, the chamfered edge of the hold-down bar **140** fits at the base plate's edge **116**.

Once the locations are marked, operators drill holes in the basin's concrete floor according to known procedures. The anchor holes are vacuumed and cleaned of debris after drilling, and operators install the anchor bolts (**146**) according to known procedures while using the hold-down bar **140** as an alignment guide. Depending on the type of anchor bolts **146** used, the various anchor holes for one or more of the screen elements **110** can be drilled in advance of, during, or after setting down the screen assembly's components on the basin floor. Pre-drilling of the holes may be useful when the anchor bolts **146** are chemically set. Yet, each set of anchor holes can be drilled and bolts **146** set separately for each screen element **110** as operators continue installing along the basin floor for other types of anchors.

Once the anchor bolts **146** have been installed as shown in FIG. 9B, operators start to level the lateral screen **100A** to within a predetermined tolerance using the leveling bolts **138** located on the sides of the hold-down plates **130**. In one implementation, the lateral screen **100A** is leveled within a

6

tolerance of ± 0.25 " down the entire length of the screen **100A**. Therefore, operators preferably use a surveyor's level. The intent is to level each lateral screen **100** to within a specified tolerance rather than level one screen **100** to another. However, the leveling system can be used to achieve this goal as well.

As shown in FIG. 9C, operators then install hex nuts **147** on the anchor bolts **146** until they are flush with the notches **134** formed in the hold-down plates **130**. At this point, operators then place the outer hold-down bars **140** onto threaded anchor bolts **146** and install washers **149** and nuts **148a-b** on top of the bars **140**. The lower nuts **148a** are hand tightened at first so the leveling bolts **138** can be adjusted slightly to allow the hold-down bars **140** to fit tightly between the heads of the bolts **138**. At this point, the nuts **148a** can be tightened according to the requirements of the anchor system used. For example, if a mechanical (wedge/expansion) style anchor bolt **146** is used, the nuts **148a** can be tightened to a specified torque. If an adhesive style anchor system is used, the adhesive for the anchor bolt **146** should be cured before tightening the nuts **148a**.

Once the hold-down bar **140** is torqued to desired level, operators install a second hex nut **148b** onto the threaded anchor bolt **146** and lock them against the torque hex nuts **148a**. In the end, the outer hold-down assembly **123** holds the outside longitudinal edge **116** of the first lateral screen **100A** as shown in FIGS. 10A-10B. Locking nuts or other methods can be used to prevent these nuts **148a-b** from loosening during service.

Once the first lateral screen **100A** has been installed as above, operators then proceed with installing the next lateral screen **100B** as shown in FIG. 11. Operators place the next lateral screen **100B** in the basin B next to the installed screen **100A**. For this second screen **100B**, operators install the inner hold-down plates **150** in place underneath the screen **100B**. Then, operators use the inner hold-down bars **160** as spacers between the two screens **100A-100B**. Again, the inner hold-down bars **160** should not be in contact with the screen element **110**, but should also not be located more than halfway past the center of the edge **116** of the base plates **112**.

During these steps, operators square up the inner hold-down bars **160** inside the notches of the adjoining hold-down plates **130/150**. While doing this, operators also square up the heads of the leveling bolts **138/158** against the inner hold-down bars **160**. As before, operators use the inner hold-down bar **160** as a guide to mark the hole locations for drilling into the basin floor. Once marked, operators drill the holes in the concrete, clean the holes of debris, and install the anchor bolts **166** using the hold-down bars **160** as alignment guides. The drilling of the holes has also been described previously where the holes are laid out and drilled first (before the screens are installed). Either process will work, and what steps are done are at the discretion of the installers. When chemical anchors are used, which is often the case, the installers drill holes and install all of the anchors first so they can cure the required curing time.

Once the anchor bolts **166** have been installed, operators start to level the screen **100B** to within the predetermined tolerance using the leveling bolts **158** located on the sides of the hold-down plates **150** as shown in FIGS. 12A-12B. After the screen **100B** is level, operators begin installing the inner hold-down bars **160** onto the anchor bolts **166**. The leveling bolts **138/158** may need to be adjusted slightly to allow the hold-down bars **160** to fit tightly between the bolt heads. The inner hold-down bars **160** are squared inside the notches of the hold-down plates **130/150** as are the leveling bolt heads against the inner hold-down bars **160**.

7

Once squared up, operators place a washer **169** and hex nut **168a** onto the anchor bolts **166**, and operators tighten the hex nut **168a** onto inner hold-down bar **160**. Again, this tightening uses prescribed procedures. Finally, the second hex nuts **148b** install onto the anchor bolts **166** and lock against the torqued hex nuts **148a**. In the end, the inner hold-down assembly **125** holds the lateral screens **100A-B** as shown in FIGS. **12A-12B**.

Similar procedures are then repeated along the length of the basin B of FIGS. **8A-8B** until the required number of lateral screens **100A** through **100N** have been installed on the drop pipes P and supported by the leveling hold-down mechanism **120** of the present disclosure.

The foregoing description of preferred and other embodiments is not intended to limit or restrict the scope or applicability of the inventive concepts conceived of by the Applicants. In exchange for disclosing the inventive concepts contained herein, the Applicants desire all patent rights afforded by the appended claims. Therefore, it is intended that the appended claims include all modifications and alterations to the full extent that they come within the scope of the following claims or the equivalents thereof.

What is claimed is:

1. A leveling hold-down apparatus for lateral screens on a basin floor, the apparatus comprising:

a plurality of plates having opposing ends, each of the opposing ends having at least one threaded opening, the plates fitting between the lateral screens and a basin floor with the threaded openings exposed along longitudinal sides of the lateral screens;

a plurality of adjustment bolts threaded in the threaded openings of the plates and adjusting level of the plates relative to the basin floor; and

a plurality of bars disposing between adjoining ends of the plates on adjacent ones of the lateral screens, the bars engaging the adjoining ends of the plates and the longitudinal sides of the adjacent ones of the lateral screens, the bars anchoring to the basin floor.

2. The apparatus of claim **1**, wherein the plates comprise first plates each having inner and outer ends for the opposing ends, each of the first plates having two of the threaded openings on the outer end and having one of the threaded openings on the inner end.

3. The apparatus of claim **2**, wherein the bars comprise first bars each defining an opening fitting on an anchor affixed to the basin floor, an end of the first bar engaging the end of one of the first plates and the longitudinal side of one of the lateral screens.

4. The apparatus of claim **3**, wherein the end of each first bar disposes in a cutaway on the outer end of the first plate between the two threaded openings.

5. The apparatus of claim **1**, wherein the plates comprise second plates each having a first of the threaded openings on one of the ends and having a second of the threaded openings on the other end, the first and second threaded openings disposed on opposites sides of an axis of the second plate.

6. The apparatus of claim **5**, wherein the bars comprise second bars each defining an opening fitting on an anchor affixed to the basin floor, opposing ends of the second bar

8

engaging the ends of the adjoining plates and the longitudinal sides of the adjacent lateral screens.

7. The apparatus of claim **6**, wherein the end of each second bar disposes in cutaways on the ends of the second plates between the threaded openings.

8. The apparatus of claim **1**, wherein each of the plates comprises a bottom having upturned rims on the opposing ends of the bottom.

9. The apparatus of claim **8**, wherein the threaded openings comprises nuts affixed to the upturned rims.

10. An underdrain system for a basin floor, comprising:

a plurality of lateral screens disposing parallel to one another on the basin floor;

a plurality of plates having opposing ends, each of the opposing ends having at least one threaded opening, the plates fitting between the lateral screens and the basin floor with the threaded openings exposed along longitudinal sides of the lateral screens;

a plurality of adjustment bolts threaded in the threaded openings of the plates and adjusting level of the plates relative to the basin floor; and

a plurality of bars disposing between adjoining ends of the plates on adjacent ones of the lateral screens, the bars engaging the adjoining ends of the plates and the longitudinal sides of the adjacent ones of the lateral screens, the bars anchoring to the basin floor.

11. The system of claim **10**, wherein the plates comprise first plates each having inner and outer ends for the opposing ends, each of the first plates having two of the threaded openings on the outer end and having one of the threaded openings on the inner end.

12. The system of claim **11**, wherein the bars comprise first bars each defining an opening fitting on an anchor affixed to the basin floor, an end of the first bar engaging the end of one of the first plates and the longitudinal side of one of the lateral screens.

13. The system of claim **12**, wherein the end of each first bar disposes in a cutaway on the outer end of the first plate between the two threaded openings.

14. The system of claim **10**, wherein the plates comprise second plates each having a first of the threaded openings on one of the ends and having a second of the threaded openings on the other end, the first and second threaded openings disposed on opposites sides of an axis of the second plate.

15. The system of claim **14**, wherein the bars comprise second bars each defining an opening fitting on an anchor affixed to the basin floor, opposing ends of the second bar engaging the ends of the adjoining plates and the longitudinal sides of the adjacent lateral screens.

16. The system of claim **15**, wherein the end of each second bar disposes in cutaways on the ends of the second plates between the threaded openings.

17. The system of claim **10**, wherein each of the plates comprises a bottom having upturned rims on the opposing ends of the bottom.

18. The system of claim **17**, wherein the threaded openings comprises nuts affixed to the upturned rims.

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